THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appellant(s):	Hansen et al.
Appl. No.:	10/824,376
Conf. No.:	6618
Filed:	April 15, 2004
Title:	CHOCOLATE FLAVOR MANIPULATION
Art Unit:	1761
Examiner:	Paden, Carolyn A.
Docket No.:	112701-574

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPELLANTS' APPEAL BRIEF

Sir:

Appellants submit this Appeal Brief in support of the Notice of Appeal filed on October 16, 2007. This Appeal is taken from the Final Rejections in the Office Action dated September 18, 2007.

I. REAL PARTY IN INTEREST

The real party in interest for the above-identified patent application on Appeal is Nestec S.A. by virtue of an Assignment dated April 15, 2004 and recorded at reel 015228, frames 0487-0494 in the United States Patent and Trademark Office.

II. RELATED APPEALS AND INTERFERENCES

Appellants' legal representative and the Assignee of the above-identified patent application do not know of any prior or pending appeals, interferences or judicial proceedings which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision with respect to the above-identified Appeal.

III. STATUS OF CLAIMS

Claims 1-20 are pending in the above-identified patent application. Claims 1-20 stand rejected. Therefore, Claims 1-20 are being appealed in this Brief. A copy of the appealed claims is included in the Claims Appendix.

IV. STATUS OF AMENDMENTS

A Non-Final Office Action was mailed on April 5, 2005. In the Non-Final Office Action, the Examiner provisionally rejected the claims under 35 U.S.C. §101 and rejected the claims under 35 U.S.C. §112, paragraph 1 and 35 U.S.C. §103. A Notice of Abandonment was mailed on November 4, 2005. Appellants filed a Petition to Revive the application and a response to the Non-Final Office Action on June 15, 2006. In response to the Petition to Revive, the abandonment was withdrawn on August 16, 2006, and a Final Office Action was mailed on October 30, 2006. In the Final Office Action, the Examiner withdrew the rejections under 35 U.S.C. §§101 and 112 but maintained the obviousness rejections. Appellants filed a response to the Final Office Action on January 30, 2007 with amendments to the claims. An Advisory Action was mailed on February 13, 2007. In the Advisory Action, the Examiner did not enter the amendments. Appellants filed a Request for Continued Examination on March 26, 2007. A Non-Final Office Action in response to the Request for Continued Examination was mailed on May 8, 2007. In the Non-Final Office Action, the Examiner entered the previous amendments but maintained the obviousness rejections under 35 U.S.C. §103. Appellants filed a response to the Non-Final Office Action on August 8, 2007. A Final Office Action was mailed on September 18, 2007. In the Final Office Action, the Examiner maintained the obviousness rejections. Appellants filed a Notice of Appeal on October 16, 2007 with respect to the Final Office Action mailed on September 18, 2007. Copies of the Non-Final Office Action mailed on April 5, 2005, the Final Office Action mailed on October 30, 2006, the Non-Final Office Action mailed on May 8, 2007, and the Final Office Action mailed on September 18, 2007 are attached as Exhibits A, B, C, and D, respectively, in the Evidence Appendix.

V. SUMMARY OF CLAIMED SUBJECT MATTER

A summary of the invention by way of reference to the specification and/or figures for each of the independent claims is provided as follows:

Independent Claim 1 recites a process for manipulating the flavor of a single mass of chocolate (page 3, lines 29-32) which comprises utilizing a conventional process for manufacturing the chocolate (page 1, lines 1-30); and adding a flavor effective amount (page 3, lines 33-34; page 4, lines 1-3, 19-20) of a non-cocoa/dairy flavor attribute (page 2, lines 28-33; page 4, lines 4-10, 12-19) to the chocolate mass thus manipulating its flavor.

Independent Claim 11 recites a process for manipulating the flavor of a single mass of chocolate (page 3, lines 29-32) which comprises utilizing a conventional process for manufacturing the chocolate (page 1, lines 1-30); and adding a flavor effective amount (page 3, lines 33-34; page 4, lines 1-3, 19-20) of a non-cocoa/dairy flavor (page 2, lines 28-33; page 4, lines 4-10, 12-19) to the chocolate mass independently of the chocolate mass processes, formulations and ingredient origins (page 1, lines 10-11; page 3, lines 4-5; page 9, lines 24-29) thus manipulating the flavor.

Independent Claim 12 recites a process for manipulating the flavor of chocolate produced by a single process to obtain a desired flavor (page 2, lines 23-25) which comprises utilizing a conventional process for manufacturing the chocolate (page 1, lines 1-30); and adding a flavor effective amount (page 3, lines 33-34; page 4, lines 1-3, 19-20) of an appropriate non-cocoa/dairy flavor attribute (page 2, lines 28-33; page 4, lines 4-10, 12-19) to the chocolate mass thus manipulating its flavor.

Independent Claim 13 recites a process for the preparation of chocolate having a flavor attribute associated with chocolate other than chocolate flavor enhancement (page 2, lines 30-32) or an overriding, dominant flavor that is different than chocolate (page 2, lines 30-33) and which flavor attribute overcomes the variations in chocolate flavor obtained in the manufacture of chocolate using different processing conditions and/or ingredients (page 3, lines 11-15) which comprises utilizing a conventional process for manufacturing the chocolate (page 1, lines 1-30); and adding a flavor effective amount (page 3, lines 33-34; page 4, lines 1-3, 19-20) of an appropriate non-cocoa/dairy flavor attribute (page 2, lines 28-33; page 4, lines 4-10, 12-19) to the chocolate mass.

Independent Claim 14 recites a chocolate product (page 6, lines 25-28) containing a flavor effective amount (page 3, lines 33-34; page 4, lines 1-3, 19-20) of a non-cocoa/dairy flavor attribute (page 2, lines 28-33; page 4, lines 4-10, 12-19) having a flavor attribute associated with chocolate other than chocolate flavor enhancement (page 2, lines 30-32) or an overriding, dominant flavor that is different than chocolate (page 2, lines 30-33) and which flavor attribute overcomes the variations in chocolate flavor obtained in the manufacture of chocolate using different processing conditions and/or ingredients (page 3, lines 11-15).

Independent Claim 15 recites a chocolate product (page 6, lines 25-28) containing a flavor effective amount (page 3, lines 33-34; page 4, lines 1-3, 19-20) of a non-cocoa/dairy flavor (page 2, lines 28-33; page 4, lines 4-10, 12-19) to provide roasted, sweet, bitter, crumb, caramel, fruity, floral, biscuit, baked, bready, popcorn, cereal, malty, astringent or praline attributes (page 4, lines 4-5).

Independent Claim 16 recites a method of providing a specific house flavor in a chocolate however manufactured (page 3, lines 14-15; page 9, lines 24-32) which comprises utilizing a conventional process for manufacturing the chocolate (page 1, lines 1-30); and adding a flavor effective amount (page 3, lines 33-34; page 4, lines 1-3, 19-20) of an appropriate non-cocoa/dairy flavor attribute (page 2, lines 28-33; page 4, lines 4-10, 12-19) to the chocolate mass (page 3, lines 29-32) to provide the specific house flavor to the chocolate (page 9, lines 27-32).

Independent Claim 18 recites a method of providing a specific consumer-recognizable flavor associated with chocolate (page 9, lines 27-32), other than chocolate flavor enhancement (page 2, lines 30-32) or an overriding, dominant flavor that is different than chocolate (page 2, lines 30-33), in a chocolate however manufactured (page 3, lines 14-15; page 9, lines 24-32) which comprises utilizing a conventional process for manufacturing the chocolate (page 1, lines 1-30); and adding a flavor effective amount (page 3, lines 33-34; page 4, lines 1-3, 19-20) of an appropriate non-cocoa/dairy flavor attribute (page 2, lines 28-33; page 4, lines 4-10, 12-19) to the chocolate mass (page 3, lines 29-32) to provide the consumer-recognizable flavor to the chocolate (page 9, lines 31-32).

Independent Claim 20 recites a process for the production of chocolate which comprises utilizing a conventional process for manufacturing the chocolate (page 1, lines 1-30); and adding a flavor effective amount (page 3, lines 33-34; page 4, lines 1-3, 19-20) of an appropriate non-cocoa/dairy flavor attribute (page 2, lines 28-33; page 4, lines 4-10, 12-19) to the chocolate mass

(page 3, lines 29-32) to provide the benefit of a chocolate having a particular desired flavor independently of assets, processes, formulations and ingredient origins (page 9, lines 27-29).

Although specification citations are given in accordance with C.F.R. 1.192(c), these reference numerals and citations are merely examples of where support may be found in the specification for the terms used in this section of the Brief. There is no intention to suggest in any way that the terms of the claims are limited to the examples in the specification. As demonstrated by the references numerals and citations, the claims are fully supported by the specification as required by law. However, it is improper under the law to read limitations from the specification into the claims. Pointing out specification support for the claim terminology as is done here to comply with rule 1.192(c) does not in any way limit the scope of the claims to those examples from which they find support. Nor does this exercise provide a mechanism for circumventing the law precluding reading limitations into the claims from the specification. In short, the references numerals and specification citations are not to be construed as claim limitations or in any way used to limit the scope of the claims.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Claims 1-5 and 11-20 are rejected under 35 U.S.C. §103(a) as being unpatentable over GB 2,033,721 to Ripper ("*Ripper*") in view of U.S. Patent No. 2,835,890 to Rusoff ("*Rusoff*"). Copies of *Ripper* and *Rusoff* are attached herewith as Exhibits E and F, respectively, in the Evidence Appendix.

2. Claims 1-4, 6, and 10-20 are rejected under 35 U.S.C. §103(a) as being unpatentable over *Ripper* in view of U.S. Patent No. 3,769,030 to Kleinert ("*Kleinert*") or U.S. Patent No. 5,676,993 to Watterson et al. ("*Watterson*"). Copies of *Kleinert* and *Watterson* are attached herewith as Exhibits G and H, respectively, in the Evidence Appendix.

3. Claim 7 is rejected under 35 U.S.C. §103(a) as being unpatentable over *Ripper* in view of *Rusoff* and in further view of U.S. Patent No. 4,343,818 to Eggen ("*Eggen*"). A copy of *Eggen* is attached herewith as Exhibit I in the Evidence Appendix.

4. Claims 8 and 9 are rejected under 35 U.S.C. §103(a) as being unpatentable over *Ripper* in view of *Rusoff* and in further view of U.S. Patent No. 5,888,562 to Hansen et al. ("*Hansen*"). A copy of *Hansen* is attached herewith as Exhibit J in the Evidence Appendix.

VII. ARGUMENT

A. LEGAL STANDARDS

Obviousness under 35 U.S.C. §103

The Federal Circuit has held that the legal determination of an obviousness rejection under 35 U.S.C. § 103 is:

> whether the claimed invention as a whole would have been obvious to a person of ordinary skill in the art at the time the invention was made...The foundational facts for the prima facie case of obviousness are: (1) the scope and content of the prior art; (2) the difference between the prior art and the claimed invention; and (3) the level of ordinary skill in the art...Moreover, objective indicia such as commercial success and long felt need are relevant to the determination of obviousness...Thus, each obviousness determination rests on its own facts.

In re Mayne, 41 U.S.P.Q. 2d 1451, 1453 (Fed. Cir. 1997).

In making this determination, the Patent Office has the initial burden of proving a *prima facie* case of obviousness. *In re Rijckaert*, 9 F.3d 1531, 1532, 28 U.S.P.Q. 2d 1955, 1956 (Fed. Cir. 1993). This burden may only be overcome "by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings." *In re Fine*, 837 F.2d 1071, 1074, 5 U.S.P.Q. 2d 1596, 1598 (Fed. Cir. 1988). "If the examination at the initial stage does not produce a prima facie case of unpatentability, then without more the applicant is entitled to grant of the patent." *In re Oetiker*, 24 U.S.P.Q. 2d 1443, 1444 (Fed. Cir. 1992).

Moreover, the Patent Office must provide explicit reasons why the claimed invention is obvious in view of the prior art. The Supreme Court has emphasized that when formulating a rejection under 35 U.S.C. § 103(a) based upon a combination of prior art elements it remains necessary to identify the reason why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed. *KSR v. Teleflex*, 127 S. Ct. 1727 (2007).

Of course, references must be considered as a whole and those portions teaching against or away from the claimed invention must be considered. *Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve Inc.*, 796 F.2d 443 (Fed. Cir. 1986). "A prior art reference may be considered to teach away when a person of ordinary skill, upon reading the reference would be discouraged

from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the Applicant." *Monarch Knitting Machinery Corp. v. Fukuhara Industrial Trading Co., Ltd.*, 139 F.3d 1009 (Fed. Cir. 1998), quoting, *In re Gurley*, 27 F.3d 551 (Fed. Cir. 1994).

B. THE CLAIMED INVENTION

Independent Claim 1 recites, in part, in part, a process for manipulating the flavor of a single mass of chocolate. The single mass of chocolate is manufactured utilizing a conventional process. A flavor effective amount of a non-cocoa/dairy flavor attribute is added to the chocolate mass thus manipulating its flavor.

Independent Claim 11 recites, in part, a process for manipulating the flavor of a single mass of chocolate. The single mass of chocolates is manufactured utilizing a conventional process. A flavor effective amount of a non-cocoa/dairy flavor is added to the chocolate mass. This non-cocoa/dairy flavor is added independently of the chocolate mass processes, formulations and ingredient origins thus manipulating the flavor.

Independent Claim 12 recites, in part, a process for manipulating the flavor of chocolate produced by a single process to obtain a desired flavor. The chocolate is manufactured utilizing a conventional process. A flavor effective amount of an appropriate non-cocoa/dairy flavor attribute is added to the chocolate mass thus manipulating its flavor.

Independent Claim 13 recites, in part, a process for the preparation of chocolate having a flavor attribute associated with chocolate. The flavor attribute is an attribute other than chocolate flavor enhancement or an overriding, dominant flavor that is different than chocolate. The flavor attribute overcomes the variations in chocolate flavor obtained in the manufacture of chocolate using different processing conditions and/or ingredients. The chocolate is manufactured utilizing a conventional process. A flavor effective amount of an appropriate non-cocoa/dairy flavor attribute is added to the chocolate mass.

Independent Claim 14 recites, in part, a chocolate product containing a flavor effective amount of a non-cocoa/dairy flavor attribute. The chocolate product has a flavor attribute associated with chocolate other than chocolate flavor enhancement or an overriding, dominant flavor that is different than chocolate. The flavor attribute overcomes the variations in chocolate

flavor obtained in the manufacture of chocolate using different processing conditions and/or ingredients.

Independent Claim 15 recites, in part, a chocolate product containing a flavor effective amount of a non-cocoa/dairy flavor. The non-cocoa/dairy flavor provides roasted, sweet, bitter, crumb, caramel, fruity, floral, biscuit, baked, bready, popcorn, cereal, malty, astringent or praline attributes.

Independent Claim 16 recites, in part, a method of providing a specific house flavor in a chocolate however manufactured. The chocolate is manufactured utilizing a conventional process. A flavor effective amount of an appropriate non-cocoa/dairy flavor attribute is added to the chocolate mass to provide the specific house flavor to the chocolate.

Independent Claim 18 recites, in part, a method of providing a specific consumer-recognizable flavor associated with chocolate. The consumer-recognizable flavor is a flavor other than chocolate flavor enhancement or an overriding, dominant flavor that is different than chocolate. The consumer-recognizable flavor is provided in a chocolate however manufactured. The chocolate is manufactured utilizing a conventional process. A flavor effective amount of an appropriate non-cocoa/dairy flavor attribute is added to the chocolate mass to provide the consumer-recognizable flavor to the chocolate.

Independent Claim 20 recites, in part, a process for the production of chocolate. The chocolate is manufactured utilizing a conventional process. A flavor effective amount of an appropriate non-cocoa/dairy flavor attribute is added to the chocolate mass to provide the benefit of a chocolate having a particular desired flavor independently of assets, processes, formulations and ingredient origins.

C. THE REJECTION OF CLAIMS 1-5 AND 11-20 UNDER 35 U.S.C. §103(a) TO *RIPPER* AND *RUSOFF* SHOULD BE REVERSED BECAUSE THE EXAMINER HAS NOT ESTABLISHED A *PRIMA FACIE* CASE OF OBVIOUSNESS

Appellants respectfully submit that there exists no reason why the skilled artisan would combine the cited references to arrive at the present claims and, even if combinable, the cited references fail to disclose or suggest every element of the presently pending claims. Independent Claims 1, 11-13, 16, 18, and 20 are directed, in part, to processes for manipulating the flavor of a mass of chocolate utilizing a conventional process for manufacturing the chocolate and adding a

flavor effective amount of a non-cocoa/dairy flavor to the chocolate mass. Independent Claims 14-15 are directed, in part, to chocolate products containing a flavor effective amount of a non-cocoa/dairy flavor. In contrast, Appellants respectfully submit that there exists no reason why the skilled artisan would combine the cited references to obtain the present claims, and even if combinable, all of the claimed elements are not taught or suggested by the cited references.

1. There exists no reason why the skilled artisan would combine *Ripper* and *Rusoff* to arrive at the present claims

Independent Claims 1, 11-13, 16, 18, and 20 recite, in part, a process for manipulating the flavor of a mass of chocolate utilizing a conventional process for manufacturing the chocolate and adding a flavor effective amount of a non-cocoa/dairy flavor to the chocolate. *Ripper* teaches a specific method of manufacturing chocolate that eliminates the time-consuming step of conching used in traditional chocolate-making methods. See, *Ripper*, page 1, lines 7-10, 26-42, 81-85. As acknowledged by the Examiner, *Ripper* does not disclose adding a non-cocoa dairy flavor to the chocolate. See, Final Office Action dated October 30, 2006, page 5, lines 4-8. *Rusoff* teaches a process for producing an artificial chocolate flavor in order to eliminate the reliance on cacao as the source of chocolate flavor. The improved chocolate manufacturing technique of *Ripper* and the artificial chocolate flavor of *Rusoff* teach away from the claimed invention. For at least the reasons set forth below, Appellants respectfully submit that one having ordinary skill in the art would have no reason to modify or combine *Ripper* and *Rusoff* to obtain the present invention.

Appellants respectfully submit that one having ordinary skill in the art would have no reason to combine *Ripper* and *Rusoff* to arrive at the present invention because each of the cited references teaches away from the present invention. For example, the present invention describes several standard processes or traditional methods of manufacturing chocolate, each of which involves the steps of refining, conching, and tempering. See, Specification, page 1, lines 17-26. In contrast, *Ripper* is entirely directed toward non-traditional methods of manufacturing chocolate. See, *Ripper*, page 1, lines 43-50. Unlike the traditional or conventional methods of manufacturing chocolate recited, in part, by the present claims, *Ripper* specifically replaces the conching step with the use of a scraped heat exhanger. See, *Ripper*, page 1, lines 81-85.

Moreover, *Ripper* expressly teaches away from the traditional methods of manufacturing chocolate in its statement that:

> "Traditionally, quality chocolate is manufactured by mixing the chocolate-making ingredients together, and refining *and then conching* the resultant mixture...*Conching times are very extended* (10-96 hours depending upon the type of chocolate being produced). It will be appreciated from the above that the traditional chocolate-making method is expensive both in terms of process time and in terms of equipment cost. *It is an object of the present invention to provide an improved method which is relatively simple and quick* and which enables quality chocolate to be produced."

See, *Ripper*, page 1, lines 7-10, 40-50. By specifically noting the extended time required for conching and then describing the invention as an improved method for manufacturing chocolate which is relatively simple and quick, *Ripper* expressly teaches away from using traditional or conventional methods involving conching to manufacture chocolate. Thus, *Ripper* teaches away from the claimed invention.

The Examiner states that *Ripper* is a "conventional method" and there is no difference between *Ripper* and the conventional chocolate manufacturing process of the claims. See, Final Office Action dated September 18, 2007, page 4, lines 11-13. However, independent Claims 1, 11-13, 16, 18, and 20 specifically recite utilizing a conventional process for manufacturing the chocolate. Moreover, the specification describes several standard processes or traditional methods of manufacturing chocolate, each of which involves the steps of refining, conching, and tempering. See, Specification, page 1, lines 17-26. In contrast, *Ripper* is entirely directed to an improved method of manufacturing chocolate that is quicker than traditional methods of chocolate production that include conching. By distinguishing its method from traditional or conventional methods that include conching, *Ripper* teaches away from the conventional methods of the present invention. Although *Ripper* was patented in 1978, Appellants respectfully submit that the passage of time alone does not render a method conventional. Furthermore, even if the method of *Ripper* was considered conventional in the art of manufacturing chocolate, it is distinguishable from the conventional methods that include conching as required, in part, by the present claims. Therefore, Appellants respectfully submit that *Ripper* teaches away from the present claims.

Rusoff also teaches away from the present claims. For example, the present invention relates to a process for manipulating the flavor of a mass of chocolate, in part, by adding a flavor effective amount of a non-cocoa/dairy flavor to the chocolate. In contrast, *Rusoff* is entirely directed to the production of an artificial chocolate flavor that acts as a substitute for natural chocolate flavor or as a fortifier or extender of natural chocolate flavor. See, *Rusoff*, column 4, lines 47-49. Unlike the chocolate flavor or chocolate flavor enhancement of *Rusoff*, the flavor of the present invention is a non-cocoa/dairy flavor other than chocolate flavor enhancement or an overriding, dominant flavor that is different than chocolate. See, Specification, page 2, lines 30-32. Moreover, the purpose of the flavor added by the present invention is to manipulate the flavor associated with the chocolate. See, Specification, page 3, lines 2-3. Because *Rusoff* is directed to merely a chocolate flavor or chocolate flavor enhancement, *Rusoff* would discourage one of ordinary skill in the art from adding other non-chocolate or non-chocolate enhancing flavors to manipulate the chocolate flavor. Thus, *Rusoff* teaches away from the present claims.

Independent Claims 14 and 15 recite, in part, a chocolate product containing a flavor effective amount of a non-cocoa/dairy flavor. Moreover, the non-cocoa/dairy flavor of the present invention is defined as a flavor other than chocolate flavor enhancement or an overriding, dominant flavor that is different than chocolate. See, Specification, page 2, lines 30-32. Thus, for at least the reasons discussed previously, *Rusoff* teaches away from independent process Claims 1, 11-13, 16, 18, and 20, as well as independent product Claims 14-15.

In sum, the Examiner has failed to consider the cited references as a whole including those portions teaching against or away from each other and/or the claimed invention. *Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve Inc.*, 796 F.2d 443, 448-49 (Fed. Cir. 1986). "A prior art reference may be considered to teach away when a person of ordinary skill, upon reading the reference would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the [Appellant]." *Monarch Knitting Machinery Corp. v. Fukuhara Industrial Trading Co., Ltd.*, 139 F.3d 1009, (Fed. Cir. 1998). Because *Ripper* teaches a non-traditional method of manufacturing chocolate that does not include conching and *Rusoff* teaches flavors that are used as fortifiers or extenders of chocolate flavor, each of the cited references teaches away from the claimed invention. Thus, one of ordinary skill in the art would have no reason to combine the cited references to obtain the invention of the present claims.

2. Even if combinable, *Ripper* and *Rusoff* do not teach or suggest all of the claimed elements of the present invention

Appellants respectfully submit that, even if combinable, the cited references fail to teach or suggest all of the required elements of the present claims. For example, the cited references fail to disclose or suggest manipulating the chocolate flavor of traditionally manufactured chocolate by adding a flavor effective amount of an appropriate non-cocoa/dairy flavor attribute as required, in part, by independent Claims 1, 11-13, 16, 18, and 20. As acknowledged by the Examiner, *Ripper* only refers to methods of manufacturing chocolate; nowhere does the cited reference disclose manipulating the flavor of the chocolate by adding a non-cocoa/dairy flavor. See, Final Office Action dated October 30, 2006, page 5, lines 4-8. The Examiner instead relies on *Rusoff* to include the required flavors. See, Final Office Action dated October 30, 2006, page 5, lines 7-8. However, as discussed previously, *Rusoff* is entirely directed to artificial chocolate flavors that act as a substitute for natural chocolate flavor or as fortifiers or extenders of natural chocolate flavor. See, *Rusoff*, column 1, lines 15-16, 33-35, column 4, lines 44-49. In contrast, the flavor attributes of the present invention are non-cocoa/dairy flavors associated with chocolate and *not* non-chocolate flavors for the mere enhancement of the chocolate flavor. See, Specification, page 2, lines 30-32. Therefore, *Rusoff* does not disclose or suggest the flavors of the present invention.

In sum, the combination of *Ripper* and *Rusoff* fails to disclose each and every element of the present invention. Instead of teaching ways to manipulate the flavor of chocolate by adding a non-cocoa/dairy flavor associated with the chocolate but not a mere enhancement of the chocolate flavor, the cited references only teach artificial chocolate flavors that are mere enhancements of natural chocolate flavor.

D. THE REJECTION OF CLAIMS 1-4, 6, AND 10-20 UNDER 35 U.S.C. §103(a) TO *RIPPER*, *KLEINERT*, AND *WATTERSON* SHOULD BE REVERSED BECAUSE THE EXAMINER HAS NOT ESTABLISHED A *PRIMA FACIE* CASE OF OBVIOUSNESS

Appellants respectfully submit that there exists no reason why the skilled artisan would combine the cited references to arrive at the present claims and, even if combinable, the cited

references fail to disclose or suggest every element of the presently pending claims. Independent Claims 1, 11-13, 16, 18, and 20 are directed, in part, to processes for manipulating the flavor of a mass of chocolate utilizing a conventional process for manufacturing the chocolate and adding a flavor effective amount of a non-cocoa/dairy flavor to the chocolate mass. Independent Claims 14-15 are directed, in part, to chocolate products containing a flavor effective amount of a non-cocoa/dairy flavor. In contrast, *Ripper* and either *Kleinert* or *Watterson* fail to suggest or teach every element of independent Claims 1, 11-16, 18, and 20 for at least the reasons set forth below.

1. There exists no reason why the skilled artisan would combine *Ripper*, *Kleinert*, and *Watterson* to arrive at the present claims

Independent Claims 1, 11-13, 16, 18, and 20 recite, in part, a process for manipulating the flavor of a mass of chocolate utilizing a conventional process for manufacturing the chocolate and adding a flavor effective amount of a non-cocoa/dairy flavor to the chocolate. *Ripper* teaches an improved method of manufacturing chocolate that eliminates the time-consuming step of conching used in traditional chocolate-making methods. See, *Ripper*, page 1, lines 7-10, 26-42, 81-85. As acknowledged by the Examiner, *Ripper* does not disclose adding a non-cocoa dairy flavor to the chocolate. See, Final Office Action dated October 30, 2006, page 5, lines 4-8. The Examiner thus relies on *Kleinert* or alternatively *Watterson* to provide the flavors of the present invention. According to the Examiner, *Kleinert* teaches the production of milk flavors for use in chocolate, and *Watterson* teaches a way of enhancing the cocoa flavor of a fat matrix. See, Non-Final Office Action dated April 5, 2005, page 6, lines 11-12; page 7, lines 1-3. The improved chocolate manufacturing technique of *Ripper*, the milk flavors of *Kleinert*, and the chocolate flavor enhancements of *Watterson* teach away from the claimed invention. For at least the reasons set forth below, Appellants respectfully submit that one having ordinary skill in the art would have no reason to modify or combine *Ripper* and either *Kleinert* or *Watterson* to obtain the present invention.

For example, the present invention describes several standard processes or traditional methods of manufacturing chocolate, each of which involves the steps of refining, conching, and tempering. See, Specification, page 1, lines 17-26. As discussed previously, *Ripper* teaches away from the present claims because it is entirely directed toward non-traditional methods of

manufacturing chocolate that remove or replace the step of conching. See, *Ripper*, page 1, lines 43-50. *Kleinert* is also directed to a "new and improved process for the manufacture of chocolate" that removes the step of conching. See, *Kleinert*, column 1, lines 1-2, 10-13. The Examiner asserts that *Kleinert* is a conventional method of manufacturing chocolate simply because it was patented in 1973. See, Final Office Action dated September 18, 2007, page 3, lines 7-8. However, as discussed previously with *Ripper*, a method does not become conventional simply with the passage of time. Moreover, the claims of the present invention are entirely directed to conventional methods that employ conching. See, Specification, page 1, lines 17-26. *Kleinert* specifically discourages one of ordinary skill in the art from utilizing the conventional techniques of the present claims in its statement that "it is possible to dispense with the conventional techniques for finally refining or finishing the chocolate mass, that is to say, by conching." See, *Kleinert*, column 1, lines 10-13. Thus, *Kleinert* teaches away from the chocolate manufacturing method of the present claims.

Moreover, *Kleinert* teaches away from the flavors required, in part, by the present claims. According to the Examiner, *Kleinert* teaches "the fabrication of milk flavors for use in chocolate." See, Non-Final Office Action dated April 5, 2005, page 6, lines 11-12. In contrast, the flavor attributes of the present invention are expressly defined as non-cocoa/dairy flavors. The Examiner further asserts that "[i]t would have been obvious to one of ordinary skill in the art to utilize the flavor of *Kleinert* in the chocolate of *Ripper* to enhance the caramel or maillard color/flavor of *Ripper*." See, Non-Final Office Action dated April 5, 2005, page 6, lines 16-18. Since the Examiner admits that *Ripper* does not disclose the flavors of the present invention, see, Final Office Action dated October 30, 2006, page 5, lines 4-8, the only flavor of *Ripper* that *Kleinert* could enhance is the chocolate flavor. However, the flavor attributes of the present invention are defined as non-cocoa/dairy flavors associated with chocolate and *not* non-chocolate flavors for the mere *enhancement* of the chocolate flavor. See, Specification, page 2, lines 30-32. Thus the milk flavors or chocolate flavor enhancements disclosed in *Kleinert* teach away from the present claims.

Watterson also teaches away from the flavors required, in part, by the present invention. The Examiner alleges that *Watterson* teaches "a way of enhancing the cocoa flavor of a fat matrix." See, Non-Final Office Action dated April 5, 2005, page 7, lines 1-3. However, as discussed previously, the flavors of the present invention are not non-chocolate flavors for the

mere enhancement of the chocolate flavor. See, Specification, page 2, lines 30-32. Alternatively, the Examiner states that *Watterson* "clearly shows the preparation of cocoa flavor." See, Final Office Action dated October 30, 2006, page 6, lines 14-15. However, the flavors of the present invention are non-cocoa/dairy flavors. Thus, *Watterson* also teaches away from the present claims.

Independent Claims 14 and 15 recite, in part, a chocolate product containing a flavor effective amount of a non-cocoa/dairy flavor. Moreover, the non-cocoa/dairy flavor of the present invention is defined as a flavor other than chocolate flavor enhancement or an overriding, dominant flavor that is different than chocolate. See, Specification, page 2, lines 30-32. Thus, for at least the reasons discussed previously, *Kleinert* and *Watterson* teach away from independent process Claims 1, 11-13, 16, 18, and 20, as well as independent product Claims 14-15.

In sum, the Examiner has failed to consider the cited references as a whole including those portions teaching against or away from each other and/or the claimed invention. *Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve Inc.*, 796 F.2d 443, 448-49 (Fed. Cir. 1986). "A prior art reference may be considered to teach away when a person of ordinary skill, upon reading the reference would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the [Appellant]." *Monarch Knitting Machinery Corp. v. Fukuhara Industrial Trading Co., Ltd.*, 139 F.3d 1009, (Fed. Cir. 1998). Because *Ripper* and *Kleinert* teach non-traditional methods of manufacturing chocolate that do not include conching, *Kleinert* teaches milk or chocolate enhancement flavors, and *Watterson* teaches flavors that are used as fortifiers or extenders of chocolate flavor, each of the cited references teaches away from the claimed invention. Thus, one of ordinary skill in the art would have no reason to combine the cited references to obtain the invention of the present claims.

2. Even if combinable, *Ripper*, *Kleinert*, and *Watterson* do not teach or suggest all of the claimed elements of the present invention

Appellants respectfully submit that, even if combinable, the cited references fail to teach or suggest all of the required elements of the present claims. For example, the cited references fail to disclose or suggest manipulating the chocolate flavor of traditionally manufactured

chocolate by adding a flavor effective amount of an appropriate non-cocoa/dairy flavor attribute as required, in part, by independent Claims 1, 11-13, 16, 18, and 20. As acknowledged by the Examiner, *Ripper* only refers to methods of manufacturing chocolate; nowhere does the cited reference disclose manipulating the flavor of the chocolate by adding a non-cocoa/dairy flavor. See, Final Office Action dated October 30, 2006, page 5, lines 4-8. The Examiner instead relies on *Kleinert* and *Watterson* to include the required flavors. See, Final Office Action dated October 30, 2006, page 6, lines 8-9, page 6, lines 13-17. However, as discussed previously, *Kleinert* is entirely directed to milk or chocolate-enhancing flavors. See, Non-Final Office Action dated April 5, 2005, page 6, lines 11-12, 16-18. *Watterson* is also directed to chocolate flavor enhancements. See, Non-Final Office Action dated April 5, 2005, page 7, lines 1-3. In contrast, the flavor attributes of the present invention are non-cocoa/dairy flavors associated with chocolate and *not* non-chocolate flavors for the mere enhancement of the chocolate flavor. See, Specification, page 2, lines 30-32. Therefore, neither *Kleinert* nor *Watterson* discloses or suggests the flavors of the present invention.

In sum, the combination of *Ripper*, *Kleinert*, and *Watterson* fails to disclose each and every element of the present invention. Instead of teaching ways to manipulate the flavor of chocolate by adding a non-cocoa/dairy flavor associated with the chocolate but not a mere enhancement of the chocolate flavor, the cited references only teach milk flavors or artificial chocolate flavors that are mere enhancements of natural chocolate flavor. Thus, the cited references fail to disclose each and every element of the present claims.

E. THE REJECTION OF CLAIM 7 UNDER 35 U.S.C. §103(a) TO *RIPPER*, *RUSOFF*, AND *EGGEN* IS IMPROPER IN VIEW OF THE PATENTABILITY OF INDEPENDENT CLAIM 1

Claim 7 is rejected under 35 U.S.C. §103(a) as being unpatentable over *Ripper*, *Rusoff*, and *Eggen*. Appellants respectfully submit that the patentability of Claim 1 over *Ripper* and *Rusoff* as discussed previously renders moot the obviousness rejection of Claim 7 that depends from Claim 1. In this regard, the cited art fails to teach or suggest the elements of Claim 7 in combination with the novel elements of Claim 1.

For example, the Examiner alleges that "*Eggen* teaches the application of amylase to cocoa to hydrolyze the cocoa ingredients." See, Non-Final Office Action dated May 8, 2007, page 7, lines 2-3. However, as discussed previously, one of ordinary skill in the art would not be motivated to combine *Ripper* and *Rusoff* and, even if combinable, the combination of cited references does not disclose manipulating the chocolate flavor of traditionally manufactured chocolate by adding an appropriate non-cocoa/dairy flavor that is not a mere chocolate flavor enhancement as required, in part, by Claim 7. Therefore, *Eggen* does not cure the deficiencies of *Ripper* and *Rusoff* and does not teach or suggest the required elements of Claim 7 that depends from independent Claim 1.

Accordingly, Appellants respectfully submit that Claim 7 is novel, nonobvious and distinguishable from the cited references and is in condition for allowance.

F. THE REJECTION OF CLAIMS 8 AND 9 UNDER 35 U.S.C. §103(a) TO *RIPPER, RUSOFF*, AND *HANSEN* IS IMPROPER IN VIEW OF THE PATENTABILITY OF INDEPENDENT CLAIM 1

Claims 8 and 9 are rejected under 35 U.S.C. §103(a) as being unpatentable over *Ripper*, *Rusoff*, and *Hansen*. Appellants respectfully submit that the patentability of Claim 1 over *Ripper* and *Rusoff* as discussed previously renders moot the obviousness rejection of Claims 8 and 9 that depend from Claim 1. In this regard, the cited art fails to teach or suggest the elements of Claims 8 and 9 in combination with the novel elements of Claim 1.

For example, Claim 8 requires that the flavor attribute be a malty crumb flavor obtained by acid treatment of a cocoa liquor followed by a protease treatment. Claim 9 also requires a crumb flavor attribute. The Examiner asserts that *Hansen* teaches treating cocoa nibs with an acid and adding carboxypeptidase as a protease treatment. See, Non-Final Office Action dated May 8, 2007, page 7, lines 16-18. Although the Examiner acknowledges that *Hansen* does not disclose malty flavor, she asserts it would be "obvious to one of ordinary skill in the art to treat the chocolate of *Ripper* by the process of *Hansen* to enhance the flavor precursors in chocolate." See, Non-Final Office Action dated May 8, 2007, page 7, line 21, page 8, lines 1-2. However, as discussed previously, the flavor attributes of independent Claim 1 and Claims 8 and 9 that depend therefrom are non-cocoa/dairy flavors that are not mere chocolate flavor enhancements.

Moreover, for reasons discussed above, one of ordinary skill in the art would have no reason to combine *Ripper* and *Rusoff* to arrive at the present invention and, even if combinable, the combination of cited references does not disclose manipulating the chocolate flavor of traditionally manufactured chocolate by adding an appropriate non-cocoa/dairy flavor that is not a mere chocolate flavor enhancement as required, in part, by Claims 8 and 9. Therefore, *Hansen* does not cure the deficiencies of *Ripper* and *Rusoff* and does not teach or suggest the required elements of Claims 8 and 9 that depend from independent Claim 1.

Accordingly, Appellants respectfully submit that Claims 8 and 9 are novel, nonobvious and distinguishable from the cited references and are in condition for allowance.

For at least the reasons discussed above, there exists no reason why the skilled artisan would combine the cited references of *Ripper* and *Rusoff*. There also exists no reason why the skilled artisan would combine the cited references of *Ripper*, *Kleinert*, and *Watterson*. Furthermore, even if combinable, the cited references fail to disclose or suggest every element of the present claims. Accordingly, Appellants respectfully submit that independent Claims 1, 11-16, 18, and 20 and Claims 2-10, 17, and 19 that depend therefrom are novel, nonobvious and distinguishable from the cited references and are in condition for allowance.

VIII. CONCLUSION

Appellants respectfully submit that the Examiner has failed to establish obviousness under 35 U.S.C. §103(a) with respect to the rejections of Claims 1-20. Accordingly, Appellants respectfully submit that the obviousness rejections are erroneous in law and in fact and should therefore be reversed by this Board.

The Director is authorized to charge $500 for the Appeal Brief and any additional fees which may be required, or to credit any overpayment to Deposit Account No. 02-1818. If such a withdrawal is made, please indicate the Attorney Docket No. 112701-574 on the account statement.

Respectfully submitted,

BELL, BOYD & LLOYD LLP

BY _____

Robert M. Barrett
Reg. No. 30,142
Customer No. 29157

Dated: December 13, 2007

CLAIMS APPENDIX

PENDING CLAIMS ON APPEAL OF U.S. PATENT APPLICATION SERIAL NO. 10/824,376

1. A process for manipulating the flavor of a single mass of chocolate which comprises utilizing a conventional process for manufacturing the chocolate; and adding a flavor effective amount of a non-cocoa/dairy flavor attribute to the chocolate mass thus manipulating its flavor.

2. The process according to claim 1, wherein the flavor attribute provides any of the following attributes: roasted, sweet, bitter, crumb, caramel, fruity, floral, biscuit, baked, bready, popcorn, cereal, malty, astringent or praline.

3. The process according to claim 1, wherein the flavor attribute is a single ingredient or a mixture of ingredients or it is a reaction flavor attribute formed from a mixture of flavor precursors.

4. The process according to claim 1, wherein the amount of flavor attribute added to the chocolate mass is from 0.001% to 15% by weight based on the weight of the chocolate mass.

5. The process according to claim 1, wherein the flavor attribute is a concentrate formed by adding a mixture of flavor precursors comprising

(A) proline, ornithine or protein hydrolysate, and

(B) rhamnose, fructose or fucose,

to a fat-based medium and heating the mixture to about 100-140°C for about 10-120 minutes.

6. The process according to claim 1, wherein the flavor attribute is a Maillard reaction product between defined mixtures of amino acids and sugars in chocolate compatible fat systems, roasted using cocoa liquor technology in the presence or absence of water.

7. The process according to claim 1, wherein the flavor attribute is an enzymatic hydrolysate of a cocoa polysaccharide.

8. The process according to claim 1, wherein the flavor attribute is a malty crumb flavor obtained by acid treatment of a cocoa liquor followed by a protease treatment.

9. The process according to claim 2, wherein the flavor attribute is a crumb flavor attribute that is added to a non-crumb chocolate mass in an amount of from 0.1% to 5%.

10. The process according to claim 2, wherein the flavor attribute is a caramel flavor attribute provided by the reaction of skimmed milk powder in a fat system at an elevated temperature.

11. A process for manipulating the flavor of a single mass of chocolate which comprises utilizing a conventional process for manufacturing the chocolate; and adding a flavor effective amount of a non-cocoa/dairy flavor to the chocolate mass independently of the chocolate mass processes, formulations and ingredient origins thus manipulating the flavor.

12. A process for manipulating the flavor of chocolate produced by a single process to obtain a desired flavor which comprises utilizing a conventional process for manufacturing the chocolate; and adding a flavor effective amount of an appropriate non-cocoa/dairy flavor attribute to the chocolate mass thus manipulating its flavor.

13. A process for the preparation of chocolate having a flavor attribute associated with chocolate other than chocolate flavor enhancement or an overriding, dominant flavor that is different than chocolate and which flavor attribute overcomes the variations in chocolate flavor obtained in the manufacture of chocolate using different processing conditions and/or ingredients which comprises utilizing a conventional process for manufacturing the chocolate; and adding a flavor effective amount of an appropriate non-cocoa/dairy flavor attribute to the chocolate mass.

14. A chocolate product containing a flavor effective amount of a non-cocoa/dairy flavor attribute having a flavor attribute associated with chocolate other than chocolate flavor enhancement or an overriding, dominant flavor that is different than chocolate and which flavor attribute overcomes the variations in chocolate flavor obtained in the manufacture of chocolate using different processing conditions and/or ingredients.

15. A chocolate product containing a flavor effective amount of a non-cocoa/dairy flavor to provide roasted, sweet, bitter, crumb, caramel, fruity, floral, biscuit, baked, bready, popcorn, cereal, malty, astringent or praline attributes.

16. A method of providing a specific house flavor in a chocolate however manufactured which comprises utilizing a conventional process for manufacturing the chocolate; and adding a flavor effective amount of an appropriate non-cocoa/dairy flavor attribute to the chocolate mass to provide the specific house flavor to the chocolate.

17. The method according to claim 16 which provides the benefits of optimization of asset utilization, cost reduction and recipe flexibility.

18. A method of providing a specific consumer-recognizable flavor associated with chocolate, other than chocolate flavor enhancement or an overriding, dominant flavor that is different than chocolate, in a chocolate however manufactured which comprises utilizing a conventional process for manufacturing the chocolate; and adding a flavor effective amount of an appropriate non-cocoa/dairy flavor attribute to the chocolate mass to provide the consumer-recognizable flavor to the chocolate.

19. The method according to claim 18 which provides the benefits of optimization of asset utilization, cost reduction and recipe flexibility.

20. A process for the production of chocolate which comprises utilizing a conventional process for manufacturing the chocolate; and adding a flavor effective amount of an appropriate non-cocoa/dairy flavor attribute to the chocolate mass to provide the benefit of a chocolate having a particular desired flavor independently of assets, processes, formulations and ingredient origins.

EVIDENCE APPENDIX

EXHIBIT A: Non-Final Office Action dated April 5, 2005

EXHIBIT B: Final Office Action dated October 30, 2006

EXHIBIT C: Non-Final Office Action dated May 8, 2007

EXHIBIT D: Final Office Action dated September 18, 2007

EXHIBIT E: GB 2,033,721 to Ripper ("*Ripper*"), cited by the Examiner in the Non-Final Office Actions dated April 5, 2005 and May 8, 2007 and the Final Office Actions dated October 30, 2006 and September 18, 2007

EXHIBIT F: United States Patent No. 2,835,590 to Rusoff ("*Rusoff*"), cited by the Examiner in the Non-Final Office Actions dated April 5, 2005 and May 8, 2007 and the Final Office Actions dated October 30, 2006 and September 18, 2007

EXHIBIT G: United States Patent No. 3,769,030 to Kleinert ("*Kleinert*"), cited by the Examiner in the Non-Final Office Actions dated April 5, 2005 and May 8, 2007 and the Final Office Actions dated October 30, 2006 and September 18, 2007

EXHIBIT H: United States Patent No. 5,676,993 to Watterson et al. ("*Watterson*"), cited by the Examiner in the Non-Final Office Actions dated April 5, 2005 and May 8, 2007 and the Final Office Actions dated October 30, 2006 and September 18, 2007

EXHIBIT I: United States Patent No. 4,343,818 to Eggen ("*Eggen*"), cited by the Examiner in the Non-Final Office Action dated May 8, 2007 and the Final Office Action dated September 18, 2007

EXHIBIT J: United States Patent No. 5,888,562 to Hansen et al. ("*Hansen*"), cited by the Examiner in the Non-Final Office Action dated May 8, 2007 and the Final Office Action dated September 18, 2007

EXHIBIT A

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/824,376	04/15/2004	Carl Erik Hansen	88265-7070	6618

28765 7590 04/05/2005

WINSTON & STRAWN
PATENT DEPARTMENT
1400 L STREET, N.W.
WASHINGTON, DC 20005-3502

EXAMINER	
PADEN, CAROLYN A	
ART UNIT	**PAPER NUMBER**
1761	

DATE MAILED: 04/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/824,376	HANSEN ET AL.	
	Examiner	Art Unit	
	Carolyn A Paden	1761	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 April 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☒ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Claims 2-20 are provisionally rejected under 35 U.S.C. 101 as claiming the same invention as that of claims 1-25 of copending Application No. 10/819,180. This is a provisional double patenting rejection since the conflicting claims have not in fact been patented.

The co-pending application relates to manipulating the flavor of chocolate but also includes a reduced flavor chocolate. The flavor impact of the starting material is not alone seen to constitute an unobvious difference.

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claim 5 is rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for a process using the amount of flavor

precursors in the flavor medium described on pages 5-6, does not reasonably provide enablement for any and all amounts and any and all mediums. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to practice the invention commensurate in scope with these claims. It is very well known in the art that different combinations of ingredients reacted together can produce different flavors and off-flavors. Applicant has limited his flavor attributes to those shown at page 4, last full paragraph.

Claim 7 is rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for a flavor made by the process described on pages 6-7 of the specification, does not reasonably provide enablement for the flavor resulting from any enzymatic hydrolysate of cocoa polysaccharide. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to practice the invention commensurate in scope with these claims.

Claim 8 is rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for the flavor resulting for the treatment process shown on page 8 of the specification, does not reasonably provide

enablement for the flavor obtained from any acid and protease treatment. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to practice the invention commensurate in scope with these claims.

Claims 1, 3-14, 16-20 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for flavor attributes disclosed at page 4, last full paragraph, does not reasonably provide enablement for any and all flavor attributes. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to practice the invention commensurate in scope with these claims.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 1-5 & 11-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ripper in view of Rusoff (2,835,590).

Ripper discloses the manufacture of chocolate liquor by treating the chocolate with a reduced pressure to remove the undesirable flavors of the

product. Then the chocolate is combined with sugar, cocoa butter, 1% flavoring and lecithin to prepare a chocolate product for molding. Claim 1 appears to differ from Ripper in the suggestion of adding flavor precursors that contain specific ingredients. Rusoff (2,835,590) teaches that combinations of peptides containing glycine or alanine with saccharide materials act to create chocolate flavor. At column 3, line 62 rhamnose is included as a suggested saccharide. At column 2, line 65 proline is included as a flavor enhancing agent. The concept of preparing the flavor ingredient in a fat-based medium is indirectly suggested because anhydrous conditions are required for the reaction at column 3, line 51-52. Thus it would have been obvious to one of ordinary skill in the art to utilize the flavor or Rusoff in the chocolate product of Ripper in order to enhance the chocolate impact of the product. It is appreciated that the specific flavors of claims 2 and 15 are not indicated but these flavor notes are well known descriptors of chocolate. It is also appreciated that "house flavor" and "asset utilization" and "cost reduction" and "recipe flexibility" are not mentioned but these features would be obvious variants of the basic Rusoff teachings. The specificity of these features would vary with the whims of

the market and taste of the consumer and are not seen to add patentable weight to the claims.

Claims 1- 4, 6 & 10-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ripper in view of Kleinert (3,769,030) or Watterson (5,676,993).

Ripper discloses the manufacture of chocolate liquor by treating the chocolate with a reduced pressure to remove the undesirable flavors of the product. Then the chocolate is combined with sugar, cocoa butter, 1% flavoring and lecithin to prepare a chocolate product for molding. The claims appear to differ from Ripper in the suggestion of adding flavor precursors that contain specific ingredients. Kleinert teaches the fabrication of milk flavors for use in chocolate by the development of the Maillard reaction products or carmelization reaction products (column 3, lines 48-59 & example 1. Although roasting is not specifically suggested in the reference, no unobvious or unexpected difference is seen between the heat treatment Kleinert and roasting. It would have been obvious to one of ordinary skill in the art to utilize the flavor of Kleinert in the chocolate of Ripper in order to enhance the caramel or maillard color/flavor of Ripper by using the fabricated flavors of Kleinert.

Similarly Watterson teaches that the Maillard reaction products of sugar and amino acids provide a way of enhancing the cocoa flavor of a fat matrix (see abstract). It would have been obvious to one of ordinary skill in the art to utilize the flavor of Watterson in the chocolate of Ripper in order to enhance the maillard flavor of Ripper by using the fabricated flavors of Watterson.

It is also appreciated that "house flavor" and "asset utilization" and "cost reduction" and "recipe flexibility" are not mentioned but these features would be obvious variants of the basic Rusoff teachings. The specificity of these features would vary with the whims of the market and taste of the consumer and are not seen to add patentable weight to the claims.

Claims 21-25 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The specific definition of "house flavor" in claim 21 is unclear. Does applicant intend to mean "old sock aroma" or "moldy house" aroma? Does applicant mean "Hershey Town Flavor" and "Nestle Flavor"? If so, it is unclear to examiner as to what specific ingredients would constitute this flavor. Cancellation of this claim is suggested. Claims 22-25 refer to asset

utilization and cost reduction and recipe flexibility and it is unclear from the claims as to how these features can be achieved by the process steps set forth in the claims. Cancellation of these claims is suggested.

Claims 22-25 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The specification does not adequately set forth how the chocolate flavor process can lead to asset utilization, cost reduction and recipe flexibility. Cancellation of these claims is suggested.

Claims 6-8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 6-8 appear to be improperly dependent from claim 1 because claim 1 is directed to a non cocoa flavor and dependent claims 6-8 are directed to a cocoa flavor. Clarification is requested.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

All of the Rusoff references are directed to the manufacture of cocoa flavor. US Patents 2,835,592-2,835,593 & 2,887,384-2,887,388 & 3,582,360 & 4,563,365 are directed to cocoa flavorings from non-cocoa sources. Each of these references could be combined with Ripper and utilized as references against at least claim 1 but have not been included in the office action in the expectation that applicant will amend the claims in order to avoid additional duplicative rejections.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Carolyn A Paden whose telephone number is (571) 272-1403. The examiner can normally be reached on Monday to Friday from 7 am to 3:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Milton Cano, can be reached on (571) 272-1398 or by dialing 571-272-1700. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is

available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Carolyn Paden 3-24-05
CAROLYN PADEN
PRIMARY EXAMINER 1761

Printed from:

http://reviews.cnet.com/pc-games/ultimate-yahtzee-pc/4505-9696_7-30984169.html?tag=sub

On: 12/13/07

US005324041A

United States Patent [19]

Boylan et al.

[11] Patent Number: 5,324,041

[45] Date of Patent: Jun. 28, 1994

[54] **HIGH CARD WAGERING GAME**

[75] Inventors: **Eugene E. Boylan**, Zephyr Cove; **David S. Schuger**, Las Vegas; **Russell R. Hebert**, Minden; **Robert F. Koerner**, Gardnerville, all of Nev.

[73] Assignee: **BET Technology, Inc.**, Carson City, Nev.

[21] Appl. No.: **51,790**

[22] Filed: **Apr. 26, 1993**

[51] Int. Cl.[5] **A63F 1/00**

[52] U.S. Cl. **273/292**; 273/309

[58] Field of Search 273/292, 274, 309

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,362,303	12/1982	Pell	273/274
4,651,997	3/1987	Wood	273/274
4,659,087	4/1987	Shen et al.	273/274
4,836,553	6/1989	Suttle et al.	273/292
5,072,946	12/1991	Miller	273/292
5,098,107	3/1992	Boylan et al.	273/292
5,141,234	8/1992	Boylan et al.	273/306

OTHER PUBLICATIONS

"Over/Under 13 Blackjack", Gaming Concepts, Inc. 1988.

"Games View", Games & Puzzles, Feb. 1976, p. 18.

Scarne's Encyclopedia of Games by John Scarne, Harper & Row, Publishers 1973, pp. 315-316, 360-361.

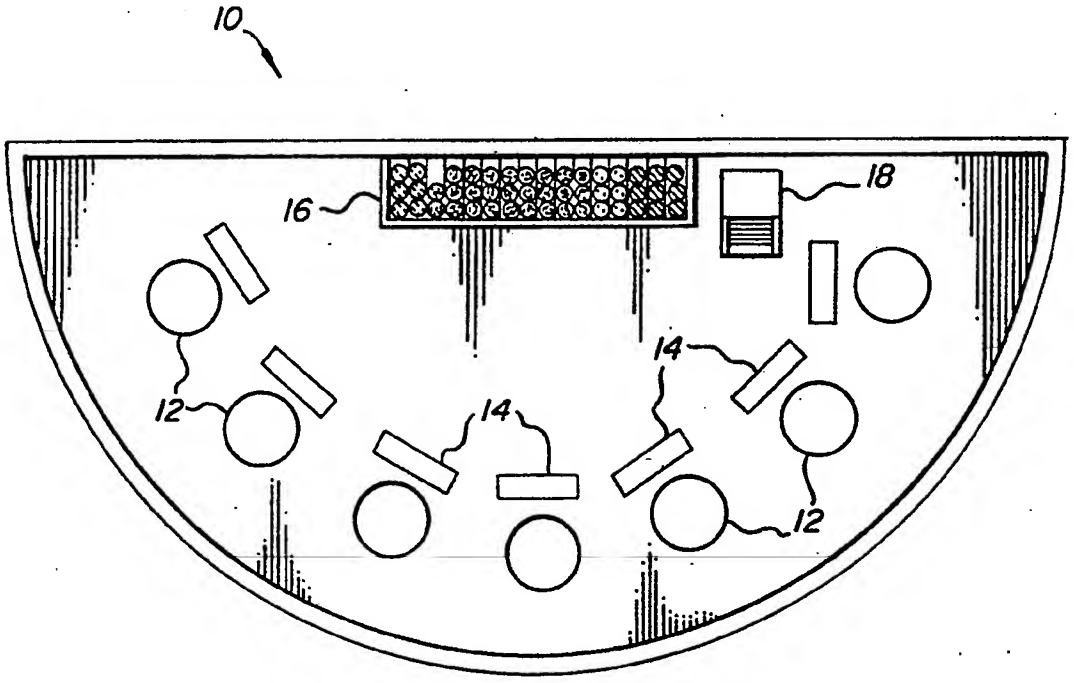
Primary Examiner—Benjamin H. Layno

Attorney, Agent, or Firm—Larson and Taylor

[57] **ABSTRACT**

A method of playing a wagering game based broadly on the "war" game is played where an ante bet is first made by each player and a card is then dealt to each player and to the dealer. It is then determined whether the card of the dealer has a greater value, a lesser value or an equal value to that of each player. The ante bet is then immediately paid off to each player with a higher value card than the dealer and to the dealer for each player with a value less than or equal to the dealer. Additionally, if the dealer ties a player, each tied player then (optionally) wagers a further bet (whose payoff odds are in favor of the player) which is followed by the dealing of at least one further card to each tied player and to the dealer to see who wins the further bet(s). The paying off of the further bet also preferably includes in the event of a further tie either a win to the dealer, a win to the player, or a further deal to the player and dealer. A tie bet that the player and dealer will tie can also be made by any player at the same time that the ante bet is wagered.

18 Claims, 1 Drawing Sheet



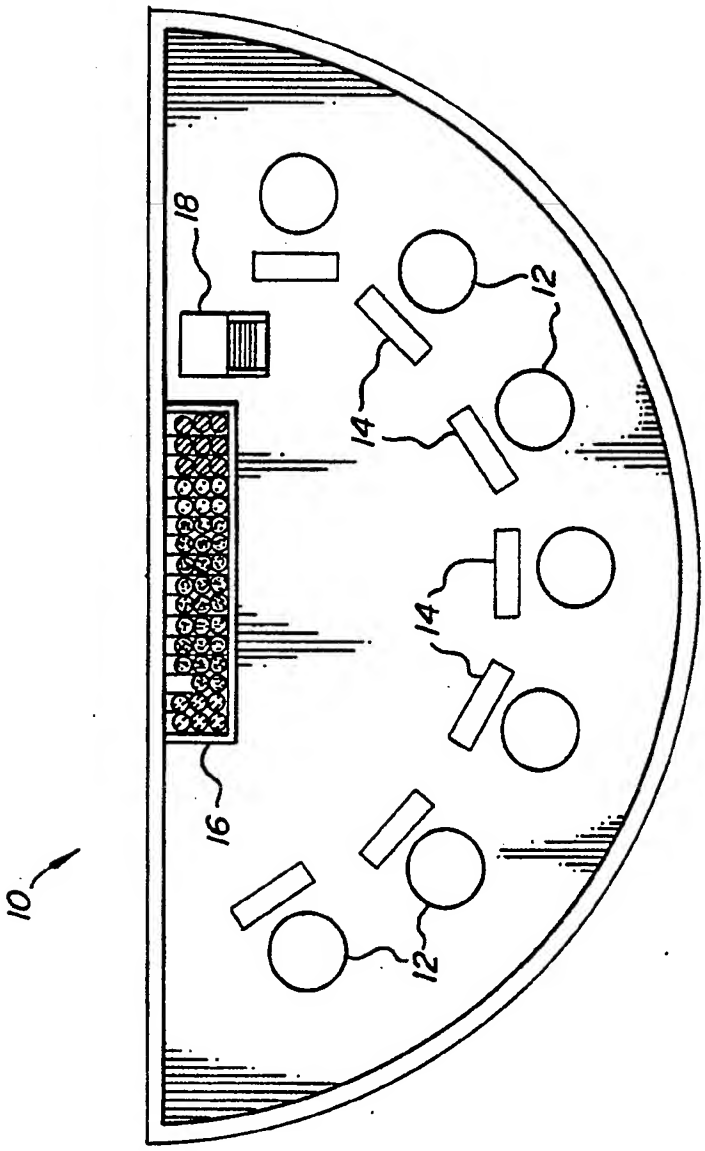


Fig. 1

HIGH CARD WAGERING GAME

FIELD OF THE INVENTION

The present invention relates generally to a wagering card game and more particularly to a wagering "war" type game in which ties are possible and result in further wagering.

BACKGROUND OF THE INVENTION

The card game "war" is well known and played with great frequency. However, this game is not suited for use as a wagering game since the outcome is generally not determined for a long time after the commencing of the game. Further, the game is not suited for use as a casino type game which foremost requires a house advantage and which also generally requires fast-paced action and frequent betting.

SUMMARY OF THE INVENTION

In accordance with the present invention, a method of playing a wagering game based broadly on the "war" card game is provided. The wagering game is thus played between a player or a group of respective players and a dealer, with the outcome determined by randomly generated playing cards having various values (i.e., a deck or a plurality of decks of playing cards). In the method, an ante bet is first made by the or each player and a card is then dealt to the or each player and to the dealer by the dealer. It is then determined whether the card of the dealer has a greater value, a lesser value or an equal value to that of the or each player. The ante bet is then immediately paid off to (a) the or each player if the value of the card of the or each player is greater than the value of the card of the dealer, or (b) the dealer if the value of the card of the dealer is greater than or equal to the value of the card of the or each player.

Additionally, if the value of the card of the dealer equals that of any player, the or each tied player then (optionally) wagers a further bet which is followed by the dealing of at least one further card to the or each tied player and to the dealer. Then, as before with the originally dealt card, it is determined whether the further card of the dealer has a greater value, a lesser value or an equal value to the further card of the or each tied player. Depending on this determination, the further bet is paid off to (a) the or each tied player if the value of the further card of the or each tied player is greater than the value of the card of the dealer, or (b) the dealer if the value of the card of the dealer is greater than the value of the card of the or each tied player.

The paying off of the further bet also preferably includes one of the following steps, depending on the method of play desired for the wagering game where the value of the further card of the or any player is equal in value to that of the dealer. In one embodiment, there is the further step of dealing additional further cards to the or each tied player and dealer until one or the other has a card of greater value than the other in a deal and therefor wins the further bet. In a second embodiment, favoring the player, there is the step of paying off of the further bet to the or each tied player so that the or each tied player therefor wins the further bet when the further cards tie. As a third embodiment, favoring the dealer, there is the step of paying off of the further bet to the dealer so that the dealer therefor wins the further bet when the further cards tie.

In the preferred embodiment of playing the wagering game of the present invention, the wagering of the further bet step includes the step of accepting only further wagers of equal or lesser value than the ante wager of the particular player. With such a step, the paying off of the ante bet to the player step preferably includes the step of paying back to the player an amount equal to the ante bet of that player and the paying back to the player a payoff of at least 1.5:1 of any further bet which is won by the player.

To provide for further betting, the method of the present invention also includes the step of wagering a tie bet by the or any player at the same time that the ante bet is wagered. Then, after the first determining step, the tie bet is paid off to the or any player if the value of the card of the dealer is equal to the value of the card of the player making the tie bet. Preferably, the paying off of the tie bet includes the step of paying back to the player a payoff of at least 8:1 of the tie bet.

To add more suspense to the game, the dealing of at least one further card step includes the step of dealing at least one burn or face down card before dealing the further card to the or each player and the dealer. In addition, the dealing of at least one further card step includes the step of selecting the number of burn cards to deal by use of a chance generating mechanism.

If desired, the wagering game could also include the step of wagering an association bet by the or any player at the same time that the ante bet is wagered. Then, after the first determining step, there would be a step of paying off of the association bet to the or any player if there is a predetermined association between the card of the dealer and the card of the player making the association bet.

It is an object of the present invention to provide a wagering game which generates increased interest and participation.

It is also an object of the present invention to provide a wagering game with increased opportunities to wage in addition to those found in a usual wagering game.

It is another object of the present invention to provide a wagering game which achieves the above-noted object and in addition is simple and easily understood.

Other features, objects and advantages of the present invention are stated in or apparent from detailed descriptions of presently preferred embodiments of the invention found hereinbelow.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic representation of a betting display surface for a wagering game according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference now to the drawing in which like numerals represent like elements, the wagering game of the present invention is preferably played using a casino type display means 10 as depicted. However, while the present invention is explained in the context of a casino game hereinbelow, it will be appreciated that the wagering game is adaptable for home use or as an electronic game using the principals discussed. It will also be appreciated that although the wagering game is designed to have the highest value card the winner, it

could instead be the lowest card or there could be other means of designating the winning card besides values.

Display means **10** includes, for each of a plurality of players (in this case **7**), an area **12** for placing an ante bet and an area **14** for placing of a tie bet. The dealer is located adjacent a settling means or bank **16**, with a shoe **18** containing a plurality of decks (such as eight) of regular playing cards located adjacent thereto. Of course, special cards or a different mechanism for displaying regular cards (such as electronic) could be used if desired.

In order to play a round of the wagering game of the present invention, each player initially makes an ante bet by placing a suitable token (chip, money, etc.) or tokens on area **12**. Obviously, each player participating must place some ante bet, with a minimum (and possible maximum) ante bet or set ante bet typically designated. At the same time, each player may also choose to place a tie bet on area **14**, also as designated (as of some predetermined minimum value).

After all (mandatory) ante bets and (optional) tie bets are placed by the players, the dealer then deals one card, face up, to each of the players as well as a face up card to himself. Taking each player in turn, the dealer then determines whether the numerical value of the card of the player is greater than, less than, or equal to that of the dealer's card. If the value of the card of the player is less than or equal to that of the dealer, the player loses the ante bet which is immediately collected from area **12** by the dealer. On the other hand, if the value of the card of the player is greater than that of the dealer, the player wins and the dealer immediately pays the player an amount which in this embodiment is equal to the ante bet of that player. Using eight decks in shoe **18**, it will be appreciated that the dealer hold percentage on ante bets (the amount the dealer will be expected to win in view of the odds being in his favor, due to the dealer winning all ties) will be about 7.47%.

In addition, as the dealer determines whether the player wins or loses the ante bet, the dealer also determines if the player made a tie bet. If a tie bet was made and the value of the card of the player and dealer are equal (note that the player loses the ante bet as described above), the player wins the tie bet and the dealer immediately pays off the tie bet. The payoff of the tie bet is preferably set at a relatively high amount in view of the low odds of winning such a bet by the player, with a minimum of about 8:1 and preferably about 10:1 used in accordance with the present invention. With odds of 10:1, the dealer hold percentage on tie bets would be about 17.83%, as ties would only occur about 7.47% of the time.

When a tie does occur, and after all of the ante bets and tie bets are paid off, the dealer will then also offer the tieing player(s) the option of making a further bet in area **12** (now cleared). This offer of a further bet is made regardless of whether a tie bet was made by the tieing player. The further bet is limited to an amount equal to or less than the ante bet, and has a payoff at least equal to about 1.5:1. It will be appreciated that any payoff greater than 1:1 (or 1:0747:1 if ties go to the dealer) on the further bet will mean that the odds are in the favor of the player. Thus, a payoff of at least 1.5:1 significantly encourages the players to make further bets and stimulates interest in the game.

To determine the winner of the further bet, the dealer then deals an additional face up card to each player making such a further bet and to himself. As traditional with the "war" game, the face up card can be dealt after first "burning" or dealing three (or some other predetermined number) face down cards. After dealing the further cards, the dealer then determines whether the further card of each player has a value greater than, less than, or equal to that of the dealer. If the value of the further card of the player is less than that of the dealer, the player loses and the dealer collects the further bet from area **12**. On the other hand, if the value of the card of the player is greater than that of the dealer, the player wins and the dealer immediately pays the player an amount which in this embodiment is equal to at least 1.5 times the further bet of that player.

It will be appreciated that it is also possible for the further cards of the player and the dealer to be tied. In such situations, three choices are possible and the one chosen will depend on how the dealer (or casino owner) wants to have the method of the game proceed. If it is desired to speed up play, the tie of the further cards can be designated as a win to the player (to increase the odds for the player winning a further bet), or to the dealer (to lower the odds for the player winning the further bet, but with the overall odds still much in the player's favor). As a third option, another round of further cards could be dealt and the winner determined by that round, or succeeding rounds (in case of further ties) until either the player or dealer is a winner. While accommodations could be made for receiving further bets after a tie on a first further bet, this would probably complicate the game to a greater degree than desired and also slow up play which would not be desired. Therefore, the preferred embodiment of the wagering game of the present invention would provide for only one further bet.

As the odds are in the favor of the player when a further bet is made (due to the increased payoff), this will lower the overall dealer hold percentage. However, as the opportunity for further bets will be available only infrequently (i.e., about 7.47% of the time) and even though such further bets will almost always be made when the opportunity presents itself (in view of the odds being in favor of the player for that wager), there is only a relatively small reduction in the overall dealer hold percentage for the dealer. For example, in the situation where the further bet payoff is 2:1 and the dealer wins ties on the further bet, the player hold percentage for the further bet itself is about 38.9%. However, as this occurs only infrequently, the overall dealer hold percentage is only reduced by about 2.9% (i.e., $38.9\% \times 7.47\%$). Therefore, using the dealer hold percentage of 7.47% mentioned above, there is obviously still a definite advantage of about 4.6% to the dealer.

Depending on the desires of the dealer, or if used in a casino the casino owner (or game commission which controls the overall hold percentage of the casino), the odds can be adjusted as desired. For example, while the minimum payoffs for the tie wager have been suggested as 8:1, and preferably 10:1, this payoff could be made as high as desired (even positive for the player, such as 15:1). Similarly, the payoffs for the further bets could be some other ratio, besides the 1.5:1 or 2:1 mentioned, such as or 2.5:1. The only limiting factor would have to be that the payoffs for all bets remains in the favor of the dealer or house (assuming that having an overall winnings is desired).

While the determination of the number of face down cards dealt for each further bet can be predetermined, it would also be possible for the number to be determined

each time a further bet (or round of further bets) is made. For example, some suitable chance generating mechanism such as a six-faced die could be used to chose between zero to five face down cards or between one to three (with each number appearing on two faces). If desired, there could even be a separately colored die for the tied player or players each round and one for the dealer so that the number of face down cards of the players could be different from those of the dealer. In such a situation, the first tied player would throw both dies to determine the face down cards for the player(s) and the dealer. Such a chance generating mechanism also adds an additional security feature into the play of the game which may be important for casino operators.

In addition to the bets noted above, it would also be possible to provide additional no-value cards to the shoe so that a separate wager could also be made on whether a (or two) no-value card would be dealt (to a player, to any player, to the dealer, or to any participant). Such a wagering method is disclosed in U.S. Pat. No. 5,098,107, which is hereby incorporated by reference. This patent also discloses the use of an association wager which could be used with the present game where the bet would be that there would be some predetermined association of the cards between the player and the dealer. For example, that the cards would be of the same suit or in order. Similarly, the use of a progressive jackpot as disclosed in the patent could also be adapted to the present wagering game if desired.

As another variation, the present wagering game could also be played as a player banked card game with a kind of poker betting. In this embodiment, each player would initially wager an ante and the dealer (chosen on a rotating basis) would deal each player one card face down. Then, the first player to the dealer's left (or whatever) would have the option of making an initial wager. If an initial wager were not made, then each player in turn would have the option of making an initial wager. After an initial wager is made, each succeeding player would then either call, fold or raise the previous wager in the same manner as in poker games. At the conclusion of the betting, the remaining players would disclose their cards with the highest value card being the winner. Any ties for the highest value (winning) card would be played out in a further deal or "war" between the tied players, including further betting in the same manner as noted above for the initial deal.

While the present invention has been described with respect to exemplary embodiments thereof, it will be understood by those of ordinary skill in the art that other variations and modifications can be effected within the scope and spirit of the invention.

We claim:

1. A method of playing a wagering game between a player or a group of respective players and a dealer whose outcome is determined by randomly generated playing cards having various values comprising the steps of:

arranging only one single stack of playing cards;

wagering an ante bet by the or each player;

dealing of only one card successively from the single stack of the playing cards only to the or each player and to the dealer by the dealer;

determining whether the card of the dealer has a greater value, a lesser value or an equal value to that of the or each player;

paying off of the ante bet to (a) the or each player if the value of the card of the or each player is greater than the value of the card of the dealer, or (b) the dealer if the value of the card of the dealer is greater than or equal to the value of the card of the or each player; and

if the value of the card of the dealer equals that of any player,

wagering of a further bet by the or each tied player,

dealing successively from the stack of at least one further card only to the or each tied player and to the dealer, and

determining whether the further card of the dealer has a greater value, a lesser value or an equal value to the further card of the or each tied player, and

paying off of the further bet to (a) the or each tied player if the value of the further card of the or each tied player is greater than the value of the card of the dealer, or (b) the dealer if the value of the card of the dealer is greater than the value of the card of the or each tied player.

2. A method of playing a wagering game as claimed in claim 1 wherein the paying off of the further bet step includes the step of dealing successively from the stack additional further cards to the or each tied player and the dealer where the previous further cards of the player and dealer in a deal were of equal value until one or the other has a card of greater value than the other in a deal and therefor wins the further bet.

3. A method of playing a wagering game as claimed in claim 1 wherein the paying off of the further bet step includes the step of paying off of the further bet to the or each tied player where the further card of the player is tied with that of the dealer so that the or each tied player therefor wins the further bet.

4. A method of playing a wagering game as claimed in claim 1 wherein the paying off of the further bet step includes the step of paying off of the further bet to the dealer where the further card of the player is tied with that of the dealer so that the dealer therefor wins the further bet.

5. A method of playing a wagering game as claimed in claim 1 wherein the wagering of the further bet step includes the step of accepting only further wagers of equal or lesser value than the ante wager of that particular player.

6. A method of playing a wagering game as claimed in claim 5 wherein the paying off of the ante bet to the player step includes the step of paying back to the player an amount equal to the ante bet of that player.

7. A method of playing a wagering game as claimed in claim 6 wherein the paying off of the further bet step includes the step of paying back to the player a payoff of at least 1.5:1 of the further bet.

8. A method of playing a wagering game as claimed in claim 7 and further including the step of wagering a tie bet by the or any player at the same time that the ante bet is wagered, and after the first determining step the paying off of the tie bet to the or any player if the value of the card of the dealer is equal to the value of the card of the player making the tie bet.

9. A method of playing a wagering game as claimed in claim 8 wherein the paying off of the tie bet includes the step of paying back to the player a payoff of at least 8:1 of the tie bet.

10. A method of playing a wagering game as claimed in claim 9 wherein said dealing of at least one further card step includes the step of dealing successively from

the stock at least one burn card before dealing the further card to the or each player and the dealer.

11. A method of playing a wagering game as claimed in claim 10 wherein said dealing of at least one further card step includes the step of selecting the number of burn cards to deal by use of a chance generating mechanism.

12. A method of playing a wagering game as claimed in claim 11 and further including the step of wagering an association bet by the or any player at the same time that the ante bet is wagered, and after the first determining step the paying off of the association bet to the or any player if there is a predetermined association between the card of the dealer and the card of the player making the association bet.

13. A method of playing a wagering game as claimed in claim 1 and further including the step of wagering a tie bet by the or any player at the same time that the ante bet is wagered, and after the first determining step the paying off of the tie bet to the or any player if the value of the card of the dealer is equal to the value of the card of the player making the tie bet.

14. A method of playing a wagering game as claimed in claim 13 wherein the paying off of the tie bet includes the step of paying back to the player a payoff of at least 8:1 of the tie bet.

15. A method of playing a wagering game as claimed in claim 13 wherein said dealing of at least one further card step includes the step of dealing successively from the stack at least one burn card before dealing the further card to the or each player and the dealer after the step of selecting the number of burn cards to deal by use of a chance generating mechanism.

16. A method of playing a wagering game as claimed in claim 1 wherein said dealing of at least one further card step includes the step of dealing successively from the stack at least one burn card before dealing the further card to the or each player and the dealer.

17. A method of playing a wagering game as claimed in claim 16 wherein said dealing of at least one further card step includes the step of selecting the number of burn cards to deal by use of a chance generating mechanism.

18. A method of playing a wagering game as claimed in claim 1 and further including the step of wagering an association bet by the or any player at the same time that the ante bet is wagered, and after the first determining step the paying off of the association bet to the or any player if there is a predetermined association between the card of the dealer and the card of the player making the association bet.

* * * * *

EXHIBIT B

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/824,376	04/15/2004	Carl Erik Hansen	112701-574	6618

29157 7590 10/30/2006

BELL, BOYD & LLOYD LLC
P. O. BOX 1135
CHICAGO, IL 60690-1135

EXAMINER	
PADEN, CAROLYN A	

ART UNIT	PAPER NUMBER
1761	

DATE MAILED: 10/30/2006

Due: 1-30-07

Please find below and/or attached an Office communication concerning this application or proceeding.

RECEIVED
BELL, BOYD & LLOYD
INTELLECTUAL PROPERTY DOCKET
NOV 0 3 2006
ATTY
DOCKET # 112701-574

Office Action Summary	Application No.	Applicant(s)	
	10/824,376	HANSEN ET AL.	
	Examiner	Art Unit	
	Carolyn A. Paden	1761	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 August 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-20 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-21, 23 & 25 of copending Application No. 10/819,180. Although the conflicting claims are not identical, they are not patentably distinct from each other because the fact that no specific amount of flavor is mentioned does not alone constitute unobviousness.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

The rejection of the claims under 35 USC 101 has been withdrawn because applicant amended the claims in the '180 application.

The rejection of the claims under 35 USC 112, first paragraph has been dropped in response to applicants' arguments. The rejection of claims 1, 3-14 and 16-20 under 35 USC first paragraph has been withdrawn in response to applicants arguments relating to the scope of enablement.

Claims 7 and 8 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for that disclosed in the specification, does not reasonably provide enablement for the use of enzymes in making the flavor attributes. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to practice the invention commensurate in scope with these claims.

Applicant argues that one of ordinary skill in the art would know to use enzymes in making the flavor attributes of the claim. This has been

considered but does not alter the fact that the specification does not provide for the claimed feature.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-5 and 11-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ripper in view of Rusoff (2,835,890) for reasons of record.

Applicant argues that his chocolate is made by a standard process using conventional ingredients. This argument has been considered but the argument is not reflected in the text of the claims. Applicant recites specific ingredients for chocolate without support in the claimed invention. Applicant argues well known "consumer-recognizable flavour attributes." But most consumers would not recognize the named flavors of claim 2 in their favorite chocolate bar. Applicant argues that one of ordinary skill in the art would understand a chocolate flavor attribute to be one of many descriptors of claim 2 and not vanilla or chocolate or peppermint. This is

disagreed with. The flavor attributes of claim 2 are subjective descriptions of individual flavour profilers and not generally recognized flavours to one of ordinary skill in the chocolate manufacturing art.

Applicant argues that Ripper does not manipulate the flavor of chocolate by adding a non-cocoa/dairy flavor to the chocolate. This has been considered but is not persuasive because the rejection is not based on Ripper alone. The rejection relies on Rusoff to include the required flavors. Applicant argues that Rusoff is directed to making "Clutched flavor". This argument has been considered but is not persuasive. The reference is directed to making the same types of flavor set forth in claim 1. The flavors may have alternative uses but are also used as a fortifier or extender of natural chocolate flavor in confectionery products and column 4, lines 44-52 is relied on for support of this assertion. Applicant extrapolates the used of Rusoff to chocolate drinks but examiner cannot find a significant reference to beverages in the Rusoff patent.

Claims 1-4, 6 and 10-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ripper in view of Kleinert or Waterson for reasons of record.

Applicant argues that Kleinert does not add flavoring to the chocolate mass but rather only adds it to cocoa butter. This argument has been considered but is not persuasive. First the claims are rejected over Ripper in view of Kleinert or Waterson. At page 5, applicant argues that chocolate mass is made of a variety of ingredients including cocoa butter. But in this rejection, applicant argues that chocolate mass does not include cocoa butter. It appears that even applicant is confused as to what should be read into the claims. Second, Kleinert is used as a flavoring for Ripper in this rejection and not as a chocolate starting material. Applicants' additional arguments relating to Kleinert are not commensurate in scope with the claims because the claims do not require any specific set of ingredients or any particular process steps.

Applicant argues that Waterston does not provide a "consumer-recognizable flavor." But Waterston clearly shows the preparation of cocoa flavor. The flavors made were obviously "consumer-recognizable" because Waterston, as a consumer, detected cocoa flavor from the combination of ingredients.

No claim is allowed.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Carolyn A Paden whose telephone number is (571) 272-1403. The examiner can normally be reached on Monday to Friday from 7 am to 3:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Milton Cano, can be reached on (571) 272-1398 or

by dialing 571-272-1700. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Carolyn Paden

CAROLYN PADEN 1761
PRIMARY EXAMINER 10-26-06

EXHIBIT C

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/824,376	04/15/2004	Carl Erik Hansen	112701-574	6618

29157 7590 05/08/2007
BELL, BOYD & LLOYD LLP
P.O. Box 1135
CHICAGO, IL 60690

EXAMINER	
PADEN, CAROLYN A	

ART UNIT	PAPER NUMBER
1761	

NOTIFICATION DATE	DELIVERY MODE
05/08/2007	ELECTRONIC

Due: 8/8/07

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PATENTS@BELLBOYD.COM

References Downloaded

RECEIVED
BELL, BOYD & LLOYD
INTELLECTUAL PROPERTY DOCKET
MAY 09 2007
ATTY: BMB
DOCKET: 112701-574

Office Action Summary	Application No.	Applicant(s)	
	10/824,376	HANSEN ET AL.	
	Examiner	Art Unit	
	Carolyn A. Paden	1761	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 March 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on March 26, 2007 has been entered.

The terminal disclaimer filed January 30, 2007 has been entered and the provisional double patenting rejection has been withdrawn.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-5 and 11-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ripper in view of Rusoff (2,835,890) for reasons of record.

Ripper discloses the manufacture of chocolate liquor by treating the chocolate with a reduced pressure to remove the undesirable flavors of the

product. Then the chocolate is combined with sugar, cocoa butter, 1% flavoring and lecithin to prepare a chocolate product for molding. Claim 1 appears to differ from Ripper in the suggestion of adding flavor precursors that contain specific ingredients. Rusoff (2,835,590) teaches that combinations of peptides containing glycine or alanine with saccharide materials act to create chocolate flavor. At column 3, line 62 rhamnose is included as a suggested saccharide. At column 2, line 65 proline is included as a flavor enhancing agent. The concept of preparing the flavor ingredient in a fat-based medium is indirectly suggested because anhydrous conditions are required for the reaction at column 3, line 51-52. Thus it would have been obvious to one of ordinary skill in the art to utilize the flavor or Rusoff in the chocolate product of Ripper in order to enhance the chocolate impact of the product. It is appreciated that the specific flavors of claims 2 and 15 are not indicated but these flavor notes are well known descriptors of chocolate. It is also appreciated that "house flavor" and "asset utilization" and "cost reduction" and "recipe flexibility" are not mentioned but these features would be obvious variants of the basic Rusoff teachings. The specificity of these features would vary with the whims of

the market and taste of the consumer and are not seen to add patentable weight to the claims.

Applicant has amended the claims to indicate that the chocolate is made by a conventional process. This amendment has been considered but is not alone seen to overcome the rejection because Ripper also uses conventional processes for chocolate manufacture. Applicant argues that the flavor attributes in Ripper are different from the flavor attributes of the claims. But no difference is seen between the flavor attributes of Ripper in view of Rusoff and the flavor attributes of the claims. Applicant argues that Ripper does not use a conche. This has been considered but is not persuasive because Ripper uses an apparatus that performs the same function as a conche (compare page 1, column 1, lines 20-38 with page 1, column 1, lines 51-65). The effect of the process on the chocolate is the same inspite of the differing apparatus. Also Ripper was published in 1980 and was conventional technology at the time of the filing of this patent application. Applicant argues that there is no suggestion in Ripper to add non-cocoa flavor to the chocolate. This has been considered but is not persuasive because the rejection is not based on Ripper alone. The rejection relies on Rusoff to include the required flavors. Applicant argues

that Rusoff does not fortify chocolate with flavor but rather is an artificial chocolate flavor. If one of ordinary skill in the art wanted to boost the flavor of chocolate without expending valuable chocolate resources, it would be obvious to look to the flavoring provided by Rusoff.

Claims 1- 4, 6 & 10-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ripper in view of Kleinert (3,769,030) or Watterson (5,676,993).

Ripper discloses the manufacture of chocolate liquor by treating the chocolate with a reduced pressure to remove the undesirable flavors of the product. Then the chocolate is combined with sugar, cocoa butter, 1% flavoring and lecithin to prepare a chocolate product for molding. The claims appear to differ from Ripper in the suggestion of adding flavor precursors that contain specific ingredients. Kleinert teaches the fabrication of milk flavors for use in chocolate by the development of the Maillard reaction products or carmelization reaction products (column 3, lines 48-59 & example 1. Although roasting is not specifically suggested in the reference, no unobvious or unexpected difference is seen between the heat treatment Kleinert and roasting. It would have been obvious to one of ordinary skill in the art to utilize the flavor of Kleinert in the chocolate of

Ripper in order to enhance the caramel or maillard color/flavor of Ripper by using the fabricated flavors of Kleinert.

Similarly Watterson teaches that the Maillard reaction products of sugar and amino acids provide a way of enhancing the cocoa flavor of a fat matrix (see abstract). It would have been obvious to one of ordinary skill in the art to utilize the flavor of Watterson in the chocolate of Ripper in order to enhance the maillard flavor of Ripper by using the fabricated flavors of Watterson.

Applicant argues that the references do not provide any suggestion to add flavor to chocolate. If one of ordinary skill in the art wanted to boost the flavor of chocolate without expending valuable chocolate resources, it would be obvious to look to the flavoring provided by Watterson.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ripper in view of Russoff as applied to claims 1-5 and 11-20 above, and further in view of Eggen (4,343,818).

Ripper discloses the manufacture of chocolate liquor by treating the chocolate with a reduced pressure to remove the undesirable flavors of the product. Then the chocolate is combined with sugar, cocoa butter, flavoring and lecithin to prepare a chocolate product for molding. Claim 9

appears to differ from Ripper in the suggestion of adding flavor precursors that contain specific ingredients. Eggen teaches the application of amylase to cocoa to hydrolyze the cocoa ingredients. One of ordinary skill in the art would expect this process to sweeten the cocoa and provide for more Maillard precursor ingredients. It would have been obvious to one of ordinary skill in the art to use the hydrolysis ingredients of Eggen in the chocolate of Ripper to sweeten the chocolate product.

Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ripper in view of Rusoff as applied to claims 1-5 and 11-20 above, and further in view of Hansen (5,888,562).

Ripper discloses the manufacture of chocolate liquor by treating the chocolate with a reduced pressure to remove the undesirable flavors of the product. Then the chocolate is combined with sugar, cocoa butter, flavoring and lecithin to prepare a chocolate product for molding. Claim 10 appears to differ from Ripper in the suggestion of adding flavor ingredients obtained by acid treatment and protease treatment. Hansen teaches treating coco nibs with an acid at pH 4 and then adding in carboxypeptidase as a protease treatment. Then the nibs were roasted and processed as usual (examples 3 & 4). It would have been obvious to

one of ordinary skill in the art to treat the chocolate of Ripper by the process of Hansen in order to enhance the flavor precursors in chocolate. It is appreciated that malty flavor is not mentioned but the same acts in the same relation would have been expected to achieve the same results. .

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Carolyn A Paden whose telephone number is (571) 272-1403. The examiner can normally be reached on Monday to Friday from 7 am to 3:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Milton Cano, can be reached on (571) 272-1398 or by dialing 571-272-1700. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on

access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Carolyn Paden 4-25-07

CAROLYN PADEN
PRIMARY EXAMINER 1761

Notice of References Cited	Application/Control No. 10/824,376	Applicant(s)/Patent Under Reexamination HANSEN ET AL.	
	Examiner Carolyn A. Paden	Art Unit 1761	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-4,343,818	08-1982	Eggen, Ingmar B.	426/45
*	B	US-5,888,562	03-1999	Hansen et al.	426/45
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Carolyn Paden 4-26-07

EXHIBIT D

UNITED STATES PATENT AND TRADEMARK OFFICE

C

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/824,376	04/15/2004	Carl Erik Hansen	112701-574	6618

29157 7590 09/18/2007

BELL, BOYD & LLOYD LLP
P.O. Box 1135
CHICAGO, IL 60690

EXAMINER	
PADEN, CAROLYN A	
ART UNIT	PAPER NUMBER
1761	

NOTIFICATION DATE	DELIVERY MODE
09/18/2007	ELECTRONIC

Due: 12-18-07: Final OA

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PATENTS@BELLBOYD.COM

RECEIVED
BELL, BOYD & LLOYD
INTELLECTUAL PROPERTY DOCKET

SEP 18 2007

ATTY: BMB-MYB
DOCKET #: 112701-574

Office Action Summary	Application No.	Applicant(s)	
	10/824,376	HANSEN ET AL.	
	Examiner	Art Unit	
	Carolyn A. Paden	1761	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 August 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-5 and 11-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ripper in view of Rusoff (2,835,890) for reasons of record.

Applicant argues that Ripper is a non-traditional method of making chocolate. No difference is seen between the conventional method of Ripper and the conventional method of the claims. Ripper was patented in 1978 and is considered to be a conventional method. Applicant argues that Rusoff teaches away from the present invention because Rusoff is directed to an artificial chocolate flavor. No difference is seen between the non-cocoa/dairy flavor of the claims and the flavor of Rusoff. Applicant argues that the inclusion of the Rusoff would not manipulate chocolate flavor. No unobvious difference is seen between the recitations of "manipulating flavor" instead of "fortifying, substituting or extending flavor".

Claims 1-4, 6 and 10-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ripper in view of Kleinert (3,769,030) or Watterson (5,676,993) for reasons of record.

Applicant argues that Ripper and Kleinert are non-traditional methods of making chocolate. No difference is seen between the conventional method of Ripper or Kleinert and the conventional method of the claims. Ripper was patented in 1978 while Kleinert was patented in 1973 and are considered to be conventional methods. Applicant argues that Watterson teaches away from the present invention because Watterson is directed to an enhancing cacao flavor. Applicant argues that the inclusion of the Watterson would not manipulate chocolate flavor. No unobvious difference is seen between the recitations of "manipulating flavor" instead of "enhancing flavor". Applicant argues that Kleinert is a cocoa flavor rather than a non-cocoa flavor. This has been considered but is not persuasive. The Maillard reaction product disclosed at column 3, lines 48-59 is not a cocoa flavor per se.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ripper in view of Russoff as applied to claims 1-5 and 11-20 above, and further in view of Eggen (4,343,818) for reasons of record.

Applicants' arguments are directed to the independent claims.

Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ripper in view of Rusoff as applied to claims 1-5 and 11-20 above, and further in view of Hansen (5,888,562) for reasons of record.

Applicants' arguments are directed to the independent claims.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Carolyn A Paden whose telephone number is (571) 272-1403. The examiner can normally be reached on Monday to Friday from 7 am to 3:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Keith Hendricks, can be reached on (571) 272-1401 or by dialing 571-272-1700. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Carolyn Paden

CAROLYN PADEN 9-13-07
PRIMARY EXAMINER
GROUP ~~1300~~ 1761

EXHIBIT E

(12) UK Patent Application (19) GB (11) 2 033 721 A

(21) Application No **7933435**
(22) Date of filing
26 Sep 1979
(30) Priority data
(31) **78/38823**
(32) **30 Sep 1978**
(33) **United Kingdom (GB)**
(43) Application published
29 May 1980
(51) **INT CL³ A23G 1/00**
(52) Domestic classification
A2B 302 412 603 613 615 702 730 740 795 CB
(56) Documents cited
GB 1436358
GB 1219996
GB 1216276
GB 999116
GB 757110
GB 648174
(58) Field of search
A2B
(71) Applicant
Cadbury Schweppes Limited
Bournville
Birmingham B30 2LU
(72) Inventor
Richard Stirley Ripper
(74) Agents
Marks & Clerk

(54) Method for manufacturing chocolate

(57) A chocolate is manufactured without employing traditional time consuming mixing and refining operations by passing cocoa liquor and milk solids, if a milk chocolate is required, through a scraped heat exchanger at a temperature of 35 to 145°C under a reduced pressure of down to 5 torr to remove undesirable flavours and reduce the water content of the material to 0.5 to 1% by weight. The material is then mixed with sugar having a particle size distribution such that 98% at least by weight has a particle size less than 30 microns and passed at least once through a gap of 25 to 600 microns between relatively rotating shearing elements.

GB 2 033 721 A

SPECIFICATION

Method for manufacturing chocolate

This invention relates to a method for manufacturing chocolate.

Traditionally, quality chocolate is manufactured by mixing the chocolate-making ingredients together, and refining and then conching the resultant mixture. The basic chocolate-making ingredients are cocoa liquor, cocoa butter and sugar in the case of dark chocolate, and these ingredients plus milk solids in the case of milk chocolate. The precise ingredient and the proportions thereof vary depending upon the type of chocolate to be produced and the country for which the chocolate is intended (in this latter respect, regard is had to national taste and the prevailing regulations). The chocolate mixture is refined in order to reduce the particles to the required size so as to impart a smooth texture to the chocolate. Refining is traditionally carried out by means of refining rolls and the gap between the rolls is set to control the particle size precisely. Conching traditionally involves batch treatment of the refined material in a conch or shell-shaped vessel having a flat bed upon which heavy rollers move backwards and forwards. More recently, continuous conching has been employed. The conching operation is normally effected at a slightly elevated temperature (e.g. 46–52°C for milk chocolate and 60–70°C for dark chocolate). The conching operation is essentially to develop the flavour and to effect an intimate mix of the ingredients but does not reduce the particle size appreciably. However, for quality chocolate, a conching operation is regarded as being essential. Conching times are very extended (10–96 hours depending upon the type of chocolate being produced).

It will be appreciated from the above that the traditional chocolate-making method is expensive both in terms of process time and in terms of equipment cost.

It is an object of the present invention to provide an improved method which is relatively simple and quick and which enables a quality chocolate to be produced.

According to the present invention, there is provided a method of manufacturing chocolate comprising the steps of feeding cocoa liquor and, if a milk chocolate is desired, mild solids to a scraped heat exchanger operating at a temperature of 35–145°C under a reduced pressure of down to 5 torr so as to remove undesirable flavours and to produce a material having a water content of 0.5–1% by weight, mixing said material with sugar having a particle size distribution such that at least 98% by weight of the sugar has a particle size less than 30 microns, and passing such mixture at least once through a shearing device(s) having relatively rotating shearing elements between which there is defined a gap of 25–600 microns through which the mixture passes.

If desired, and particularly if the moisture content of the starting ingredient(s) is low, 1–2% by weight of water may be included in the material passed to the heat exchanger in order to improve removal of the undesirable (e.g. acidic) flavours.

Cocoa butter may be added to the material passed to the heat exchanger if the amount of cocoa butter in the cocoa liquor is insufficient for the required recipe. Additionally or alternatively, cocoa butter may be added after evaporation but before milling.

The scraped heat exchanger preferably takes the form of a climbing film evaporator and serves to remove undesirable flavours and so effects flavour development in the manner of the traditional conching operation. The term "scraped heat exchanger" as used herein includes a so-called "wiped" heat exchanger.

The operating temperature in the scraped heat exchanger depends upon the type of chocolate to be produced. For the production of milk chocolate, a temperature of 50 to 80°C is generally used, most preferably the temperature is 60 to 65°C. For the production of plain chocolate, higher temperatures can be employed, e.g. 50 to 110°C, preferably 70 to 100°C.

The residence time of the material in the heat exchanger may be 1 to 20 minutes although 2 to 10 minutes will generally be used. The pressure at which the heat exchanger will operate depends upon the residence time and temperature as well as upon the type of chocolate. The pressure is preferably 5 to 250 torr although it is most preferably 5 to 40 torr for a milk chocolate or 25 to 50 torr for a plain chocolate.

The shearing device preferably takes the form of a mill which has inner and outer partially toothed conical members defining said shearing elements wherein the mixture being processed passes between the conical surfaces of said members. In the shearing device, a high shear is imparted to the ingredients which are thereby intensively mixed to the required homogeneous texture and also any remaining large particles will be reduced to the required particle size to develop the required texture and thus the shearing device serves to perform the mixing and refining operations in a traditional chocolate making process.

In order to develop the required texture, it will normally be necessary to effect more than one shearing operation on the mixture in order to "work" the mixture. This may be effected by passing the mixture more than once through the same shearing device, although for continuous production, it will be effected by passing the mixture through a

series of shearing devices. Typically about 4 or 5 shearing operations will be provided with the gap between the shearing elements being decreased at each shearing operation concomitantly with a decrease in the rate of relative rotation of the shearing elements.

The gap between the shearing elements is preferably 30 to 450 microns and most preferably 150 microns. Preferably, the rate of flow of the materials through the rotary mill and the rotational speed of the mill are arranged so as to give a temperature rise not exceeding 20°C.

As mentioned above, the sugar has a particle size distibution such that at least 98% by weight of the sugar has a particle size less than 30 microns. However, it is preferred for at least 90% by weight of the sugar to have a particle size of greater than 5 microns because this can improve the ease of processing certain chocolate compositions. A large proportion of very fine sugar particles (5 microns or less) increases the viscosity of the mixture. However, such fine particles are more acceptable in chocolate compositions having a high fat content.

Preferably, the sugar has a particle size distribution such that at least 98% by weight of the sugar has a particle size less than 25 microns and 90% by weight of the sugar has a particle size greater than 8 microns.

Preferably, the sugar is so-called microcrystalline sugar wherein the particles are single crystals.

The Applicants have found that the use of sugar of the size specified above is essential in the method of their invention because, by its use, the need for breaking-down sugar particles so that they cannot be felt in the mouth is almost entirely avoided. The use of microcrystalline sugar is particularly preferred because it can be obtained with the correct particle size distribution. If granulated sugar is ground or milled to reduce the particle size thereof, it generally has to be classified to remove large quantities of particles which are too fine and which would lead to high viscosity in the chocolate which creates processing difficulties. A typical example of microcrystalline sugar is one in which not more than 2% by weight of the sugar crystals have a crystal size greater than 30 microns and not more than 10% by weight of the crystals have a crystal size less than 5 microns. The microcrystalline sugar may be made up of crystal agglomerates. The agglomerates of crystals may be either broken down into individual crystals before mixing with the other ingredients or may be broken down during the mixing process. In the latter case, the energy required to break down the crystal agglomerates into individual crystals is relatively small and therefore does not produce an unacceptable overheating of the mixture.

The particle size of the cocoa liquor solids preferably lies within the ranges specified for the sugar.

The proportions of the raw ingredients employed in the method depend upon the type of chocolate which is to be manufactured and the country in which the chocolate is intended to be sold. However, typically, where a milk chocolate is to be manufactured, the proportions of the raw ingredients will be as follows:—

2.5–10%, preferably 5% by weight of non-fat cocoa solids.
16–35%, preferable 22% by weight of cocoa butter and cocoa butter substitute.
14–40%, preferably 27% by weight of full cream milk solids.
30–55%, preferably 45% by weight of microcrystalline sugar.
0–1.5%, preferably 0.6% by weight of emulsifier (e.g. lecithin) and flavouring.
0–2%, preferably 0.4% by weight of added water.

Where a plain chocolate is to be manufactured, the porportions of the ingredients will preferably be as follows:—

12–25%, preferably 14% by weight of non-fat cocoa solids.
18–40%, preferably 30% by weight of cocoa butter and cocoa butter substitutes.
40–77%, preferably 55% by weight of microcrystalline sugar.
0–15%, preferably 0.6% by weight of emulsifying agent (e.g. lecithin) and flavouring.
0–2%, preferably 0.4% by weight of water.

An example of a method of manufacturing milk chocolate will now be described.

A mixture of 27% by weight of cocoa liquor (containing 44% by weight of non-fat cocoa solids and which had been repeatedly milled so as to ensure that it was sufficiently smooth to the palate—typically the cocoa solids had a particle size distribution such that at least 98% by weight of the particles had a size less than 30 microns), 61% by weight of full cream milk powder and 12% by weight of additional cocoa butter was mixed and passed through a climbing film evaporator (in this embodiment, a CONVAP evaporator manufactured by Alfa Laval and modified by Bauermeister for cocoa liquor treatment). The residence time in the evaporator was 2 to 10 minutes operating at a product temperature of 50 to 80°C and a vacuum of 25 to 50 torr. This removed undesirable flavour and reduced the total moisture content of the mixture to between 0.5 and 1.0% by weight.

A mixture of 44% by weight of the above treated mixture, 11% of cocoa butter, 45% of

microcrystalline sugar, and flavours was then passed through a cone-in-cone colloid mill acting as a shearing device. In this embodiment, the mill employed was a toothed colloid mill type MZ80 sold under the trade mark "Fryma" by M & M Process Equipment Limited of Hemel Hempstead, Herts, England, which had a modified milling head. The milling head of such a mill usually has inner and outer frusto-conical milling elements which are vertically arranged so that the gap between them decreases to a minimum at the bases of the frusto-cones. The inner element is rotatable relative to the outer which is held against rotation but which is movable axially relative to the inner element so as to enable the gap to be set. Also, in such a milling head, each frusto-conical surface has upper intermediate and lower annular portions. Each portion has a plurality of parallel grooves in its surface, the grooves being spaced apart around the periphery of the surface. The grooves are inclined in the peripheral direction at an acute angle with respect to the axis of the frusto-conical milling element. The grooves increase in number but decrease in width and depth stagewise in going from the upper through the intermediate to the lower portions. The grooves in the intermediate portions are inclined in the opposite sense of the inclination of the grooves in the upper and lower portions. The grooves in one element are inclined with respect to the co-operating grooves in the other element. In the modified milling head, the milling elements are modified so that the lower portions thereof are smooth, i.e. ungrooved, and the upper and intermediate portions have mutually aligned grooves which are of the same width but of different depths, the grooves of the intermediate portions being shallower than those of the upper portions. In such a modified milling head, very little milling takes place and, in some cases where the solids being processed are all sufficiently small, no milling at all may occur. However, a very high shear of the material takes place as it passes through the aforesaid minimum gap between the smooth lower portions of the milling elements. The modified head had a diameter of 80 mm and the mixture was passed through at a rate of 5 to 15 kg/minute. The narrowest or minimum gap between the relatively rotating elements was progressively reduced in successive passes from 300 microns to 25 microns, the rotational speed being correspondingly reduced from 2800 r.p.m. to 700 r.p.m. so that the temperature rise of the mixture passing through the modified mill did not exceed 20°C. In this manner, the mixture was thoroughly worked in a relatively short time compared to traditional mixing and refining operations used in conventional chocolate making. After treatment in the modified mill, the mixture was passed through a cooler (in this embodiment a Fryma Coolmix).

The resultant mixture was then moulded into blocks in the conventional way. The moulded milk chocolate blocks had eating qualities comparable with those produced by traditional chocolate making methods.

In modification, the above process was repeated to produce a plain chocolate using the following ingredients and treatment conditions:—

Cocoa liquor (containing 44% by weight of non-fat cocoa solids which had been repeatedly milled to the required size) was passed through the climbing film evaporator. Residence time was 2 to 5 minutes, operating at product temperatures of 70 to 115°C and vacuum of 25 to 50 torr. This reduced moisture content to 0.5 to 1.0% by weight and also removed undesirable flavours.

A mixture was then made using 32% of the treated cocoa liquor, 12% cocoa butter, 55% of microcrystalline sugar and 1% by weight of a mixture of lecithin and flavouring and this was passed through the modified Fryma mill using the same conditions mentioned previously.

The resultant product was a moulded plain chocolate, which had eating qualities similar to that of a plain chocolate produced by conventional techniques.

CLAIMS

1. A method of manufacturing chocolate comprising the steps of feeding cocoa liquor and, optionally, milk solids, to a scraped heat exchanger operating at a temperature of 35 to 145°C under a reduced pressure of down to 5 torr so as to remove undesirable flavours and to produce a material having a water content of 0.5 to 1% by weight, mixing said material with sugar having a particle size distribution such that at least 98% by weight of the sugar has a particle size less than 30 microns, and subjecting such mixture to shear in at least one operation by passing the mixture through a gap of 25 to 600 microns defined between relatively rotating shearing elements.

2. A method as claimed in claim 1, wherein the heat exchanger operates at a temperature of 35 to 145°C and at a pressure of 5 to 250 torr, the sugar has a particle size distribution such that at least 90% by weight thereof has a particle size greaer than 5 microns, and the shearing elements are milling elements of a rotary mill.

3. A method as claimed in claim 1 or 2, wherein 1 to 2% by weight of water is included in the material passed to the heat exchanger.

4. A method as claimed in any preceding claim wherein cocoa butter is included in the material passed to the heat exchanger.

5. A method as claimed in any preceding claim, wherein cocoa butter is added after evaporation but before shearing.

6. A method as claimed in any preceding claim, wherein the heat exchanger is a climbing film evaporator.

7. A method as claimed in any preceding claim, wherein a milk chocolate is produced and the operating temperature in the heat exchanger is 50 to 80°C.

8. A method as claimed in claim 7, wherein said operating temperature is 60 to 65°C.

9. A method as claimed in any one of claims 1 to 6, wherein a plain chocolate is produced and the operating temperature in the heat exchanger is 50 to 110°C.

10. A method as claimed in claim 9, wherein said operating temperature is 70 to 100°C.

11. A method as claimed in claim 7 or 8, wherein the pressure is 5 to 40 torr.

12. A method as claimed in claim 9 or 10, wherein the pressure is 25 to 50 torr.

13. A method as claimed in any one of claims 1 and 3 to 12, wherein the sugar has a particular size distribution such that at least 90% by weight thereof has a particle size greater than 5 microns.

14. A method as claimed in any preceding claim, wherein the sugar has a particle size distribution such that at least 98% by weight of the sugar has a particle size less than 25 microns and at least 90% by weight of the sugar has a particle size greater than 8 microns.

15. A method as claimed in any preceding claim, wherein said gap is 30 to 450 microns.

16. A method as claimed in claim 15, wherein said gap is 150 microns.

17. A method as claimed in any preceding claim, wherein the rate of flow of material between the relatively rotating elements is such that the material rises in temperature by not more than 20°C.

18. A method as claimed in any preceding claim, wherein the sugar is microcrystalline sugar wherein the particles are single crystals.

19. A method as claimed in claim 1, substantially as hereinbefore described.

Printed for Her Majesty's Stationery Office
by Burgess & Son (Abingdon) Ltd.—1980.
Published at The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.

EXHIBIT F

United States Patent Office 2,835,590 Patented May 20, 1958

2,835,590

PROCESS OF PRODUCING AN ARTIFICIAL CHOCOLATE FLAVOR AND THE RESULTING PRODUCT

Irving I. Rusoff, Newark, N. J., assignor to General Foods Corporation, White Plains, N. Y., a corporation of Delaware

No Drawing. Application September 21, 1954
Serial No. 457,550

12 Claims. (Cl. 99—140)

This invention relates to an artificial chocolate flavor and to a process for making the same.

Heretofore, the development of chocolate flavor from cacao has involved numerous widely separated steps in which cacao beans are removed from their pods and subjected to well known processes which include fermentation, drying, grading and roasting. Many of these steps occur in the tropics, whereas others take place months later at the chocolate manufacturers' plants. Moreover, the skill with which the cacao is processed in these steps varies although in all of such steps a high degree of control must be exercised if a final product of high quality is to be obtained. As a result, the cost of chocolate, cocoa and other sources of chocolate flavor has become excessive. Then again, there is difficulty with control of the processing steps because of variations in the cacao itself. These and other considerations contribute to a complex marketing situation.

The invention has for its primary object the elimination of reliance on cacao as the source of chocolate flavor by development of such flavor from other raw materials.

It has now been discovered that an imitation or artificial chocolate flavor can be produced by reacting a reducing saccharide or precursor thereof with a member of a group consisting of glycyl and alanyl peptides. By "glycyl and alanyl peptides" is meant those peptides wherein the amino end of the peptide molecule is NH_2CH_2CO— or $NH_2CH(CH_3)CO$—, i. e., the non-hydroxylic residue of the amino acids glycine or alanine, respectively. These peptides may be provided either by protein degradation such as by enzyme, acid or alkaline hydrolysis as well as by well known synthetic techniques. Reaction between the peptide and the reducing saccharide may be carried out at temperatures substantially between 90°–170° C., the particular temperature employed varying with the reactivity between the peptide and the saccharide.

The peptide reactant employed may be any glycyl or alanyl peptide ranging in molecular complexity from di- and tripeptides to tetra-, penta-, and hexapeptides. Among the peptides which can be used in the present invention are:

Glycyl-glycine
Diglycyl-glycine
Triglycyl-glycine
Tetraglycyl-glycine
Pentaglycyl-glycine
Glycyl-alanine
Glycyl-alanyl-glycine
Glycyl-dialanyl-glycine
Glycyl-alanyl-leucine
Glycyl-alanyl-leucyl-isoleucine
Glycyl-α-amino-n-butyric acid
Glycyl-valine
Glycyl-leucine
Diglycyl-leucine
Triglycyl-leucyl-glycine

Diglycyl-alanyl-glycine
Diglycyl-leucyl-glycine
Glycyl-isoleucine
Glycyl-leucyl-glycine
Glycyl-leucyl-glycyl-leucine
Glycyl-leucyl-alanine
Glycyl-leucyl-leucine
Glycyl-dileucyl-leucine
Glycyl-trileucyl-leucine
Glycyl-asparagine
Glycyl-alanyl-glutamic acid
Glycyl-glutamic acid
Glycyl-glutamine
Glycyl-glutaminyl-glycine
Glycyl-phenylalanine
Glycyl-phenylalanyl-glutamic acid
Glycyl-tyrosine
Diglycyl-tyrosine
Glycyl-alanyl-glycyl-tyrosine
Glycyl-alanyl-tyrosine
Glycyl-tyrosyl-glycine
Glycyl-cysteine
Glycyl-serine
Glycyl-histidine
Glycyl-proline
Diglycyl-proline
Glycyl-prolyl-glycine
Diglycyl-hydroxyproline
Glycyl-hydroxyproline
Glycyl-tryptophan
Glycyl-methionine
Alanyl-glycine
Alanyl-glycyl-glycine
Alanyl-diglycyl-glycine
Alanyl-diglycyl-alanyl-glycyl-glycine
Alanyl-glycyl-alanine
Alanyl-glycyl-leucine
Alanyl-alanine
Dialanyl-alanine
Trialanyl-alanine
Tetraalanyl-alanine
Dialanyl-glycine
Alanyl-α-amino-n-butyric acid
Alanyl-valine
Alanyl-leucine
Alanyl-leucyl-glycine
Alanyl-leucyl-valine
Alanyl-leucyl-leucine
Alanyl-leucyl-isoleucine
Alanyl-isoleucine
Alanyl-α-amino-isobutyric acid
Alanyl-glutamine
Alanyl-phenylalanine
Alanyl-tyrosine
Alanyl-glycyl-tyrosine
Alanyl-tryptophan
Alanyl-methionine
Alanyl-histidine
Alanyl-asparagine
Alanyl-norvaline

Generally, the flavor product resulting is substantially enhanced through the addition of one or more amino acids, e. g., α-amino-n-butyric acid, alanine, arginine, aspartic acid, glycine, glutamic acid, histidine, valine, phenylalanine, proline, isoleucine, leucine, threonine, tyrosine and tryptophan. Thus, in the presence of such amino acids artificial chocolate flavors from peptides such as glycyl-alanine, glycyl-α-amino-n-butyric acid, glycyl-valine, glycyl asparagine, alanyl-α-amino-n-butyric acid, alanyl-valine, glycyl-leucine, glycyl-tyrosine, alanyl-asparagine and alanyl-methionine were enhanced.

The desired peptide may be reacted with any suitable

reducing saccharide, i. e., a saccharide capable of reducing Fehling's solution to give cuprous oxide, or with any suitable precursor thereof which expression includes all saccharides and other materials that provide a reducing saccharide or saccharides under the conditions of the reaction. These precursor materials consist mainly of those di- and polysaccharides which undergo molecular cleavage to yield reducing saccharides, such as the disaccharide, sucrose; the trisaccharide, raffinose; the polysaccharide material, dextrin, which of itself comprises both reducing saccharides and precursors thereof; etc. The reducing saccharides include all monosaccharides, disaccharides of the gentiobiose type, the trisaccharide manniotriose, etc. In addition, certain saccharic materials can be used which are derived from or closely related to the monosaccharides and have similar reducing properties, such as the "-uronic" acid, galacturonic acid; the desoxy sugar, rhamnose; and the penta-acetate of galactose. Thus the term "reducing saccharide" as used in the claims will be understood to include all of the reducing saccharide and saccharic compounds and precursors which provide reducing saccharide or saccharic compounds under the conditions of the reaction by degradation of the molecule or in any other manner.

It has been found necessary that, in order to achieve the development of the artificial chocolate flavor, reaction must be carried out under such conditions as to effect a substantially anhydrous state of the reaction mixture at least in the later stages of the reaction. It is believed that the development of the chocolate flavor depends upon a high degree of molecular contact between the reactants and that, water, therefore, if used to facilitate intimate admixture of the reactants must be largely removed so as to provide the aforementioned substantially anhydrous condition. However, the term "substantially anhydrous" is not meant to exclude the presence of some water in the mixture. In fact, a small amount of water is formed continuously during the course of the reaction, which fact alone is sufficient to preclude a completely anhydrous state at the end of the reaction. No analytical methods are available which permit determining with accuracy the maximum amount of water permissible at the end of the reaction. Good results have been obtained when the end product at the reaction temperature contained sufficient moisture to render it more or less tacky in nature, and I believe that as much as 5–10% moisture may have been present in some of such cases. These figures cannot be determined definitely, however, and in practice it is satisfactory to observe the rule that the product upon cooling to room temperature is substantially solid and substantially dry to the touch. The term "substantially anhydrous" is to be understood to include the presence of moisture within this limitation.

The useful saccharide materials can be divided into the following groups according to the preferred temperature ranges of the reaction, although it will be understood that the stated limits of these preferred ranges are not necessarily the minimum or maximum temperatures at which some useful results can be secured.

(1) The pentoses, including aldopentoses, methyl pentoses, ketopentoses, etc. Examples are xylose, arabinose, and rhamnose. For this group, the preferred temperature range of the reaction is from 90° C. to about 130° C.

(2) The hexoses and reducing polysaccharides. In common with the pentoses of group 1, these reducing saccharides of group 2 have reactive aldehyde or ketone groups which are free to participate directly in the reaction with the peptides, but are less reactive than the pentoses so that the preferred temperature range for the reaction is approximately from 120° C. to 150° C. Examples are the aldohexoses such as glucose, galactose and mannose; the ketohexoses such as levulose and sorbose; reducing disaccharides such as lactose and maltose and other disaccharides of the gentiobiose type; the reducing trisaccharide manninotriose; etc. With this group may also be classified saccharide mixtures such as corn syrup and malt syrup which contain both dextrose and maltose, and invert sugar which contains dextrose and levulose. In addition such saccharic materials as galacturonic acid and the penta-acetate of galactose can be used in this temperature range.

(3) Non-reducing polysaccharides which are precursors of reducing saccharides, as explained above. In this group, the temperature must be high enough in the first place to cause the formation of the reducing saccharide, and the preferred temperature range is approximately 140° C. to 170° C. Examples are the polysaccharides sucrose, dextrin and raffinose.

Within these preferred ranges the times of reaction for any given saccharide varies inversely with the temperature of the reaction and also to some extent with different individual members of each group. In general the reaction time desirable to develop good flavor product in any of the above groups will not exceed about 2 hours at the low temperature end of the range for that group, and at the high temperature end of such range it may be reduced to a few minutes.

Supplemental flavoring principles may be employed with the artificial chocolate flavor to provide degrees of bitterness and/or astringency to the eventual artificial flavor, and thereby accent the somewhat fugitive character of chocolate flavor. Significantly, it has been found that these bitterness and astringency principles provide substantially the same flavor level whether added before or after reacting the peptide and reducing saccharide and, accordingly, it may be presumed that the supplemental agents do not enter into the flavor-producing reaction. Bitterness may be provided by the addition of alkaloids such as theobromine or caffein in various levels to suit personal taste. Other bitterness principles have been successfully employed such as naringin and, indeed, the latter accents chocolate character to a higher degree than equal amounts of theobromine and caffein. Likewise, astringency can be imparted to the product by employing tannins such as quebracho or chestnut tannins at a level of around 10% by weight of the flavor product. Also, various tannate complexes may be successfully employed such as the theotannates derived from tea and the like.

The artificial chocolate flavor product resulting from the process of the invention is a powdery, friable material which is soluble in aqueous media such as water, milk, and the like. The product is capable of being employed either as a substitute for natural chocolate flavor or as a fortifier or extender of natural chocolate flavor. The flavor can be incorporated into a wide variety of products such as confectionery products, dairy products, bakery goods, and various other food products. It may also be combined with fats such as cocoa butter or various hydrogenated or fractionated vegetable fats to provide an artificial chocolate or artificial chocolate coating.

The process of the present invention is illustrated by reacting the peptides listed in the following table with the reducing saccharide dextrose. The reaction was carried out both in the absence and presence of the amino acids such as those aforementioned. The resultant artificial chocolate products were evaluated flavorwise, optimal flavor scores being denoted as "high," intermediate scores as "good" and lower scores as "fair" in the following table. Specifically, a given peptide was admixed with dextrose in the ratio of 5 parts by weight of peptide to 1 part by weight of dextrose, sufficient water was added to provide substantial solution and/or dispersion of the reactants. Generally, an amount of water equal to about 30% by weight of the reactants was adequate for this purpose and provided a reaction mixture having a pasty consistency. The reaction mixture was then heated for 8 minutes at a temperature of 130° C. using an oil bath. The resulting flavor product was brown in color, friable and water soluble. It was

evaluated flavor-wise by addition to milk containing sugar and 0.075% caffein, the latter serving as the aforementioned bitterness principle. It is also possible to heat the reaction mixture at a temperature below 90° C. to remove substantially all the water and then develop the artificial chocolate flavor by heating the mixture at an elevated temperature such as 130° C. for a period of, say, 2 minutes.

Peptide	Flavor Score	
	Peptide Reacted Alone	With Amino Acid
glycyl-glycine	good	good.
glycyl-alanine	good	high.
glycyl-α-amino-n-butyric acid	fair	high.
glycyl-valine	good	high.
glycyl-leucine	fair	good.
glycyl-phenylalanine	good	good.
glycyl-tyrosine	fair	good.
glycyl-tryptophan	good	good.
glycyl-glycyl-glycine	good	good.
glycyl-asparagine		high.
glycyl-proline	good	good.
glycyl-serine	good	good.
alanyl-glycine	good	good.
alanyl-alanine	good	good.
alanyl-α-amino-n-butyric acid	fair	high.
alanyl-valine	good	high.
alanyl-leucine	good	good.
alanyl-isoleucine	good	good.
alanyl-phenylalanine	good	fair.
alanyl-methionine	fair	good.
alanyl-glycyl-glycine	good	good.
alanyl-asparagine	fair	good.
alanyl-norvaline	fair	fair.

While the present invention has been described with reference to certain specific examples, it is not to be restricted thereby but reference should be had to the appended claims for a definition of the scope and limits of the invention.

What is claimed is:

1. A process for producing an artificial chocolate flavor which comprises reacting a saccharide with a member of the group consisting of glycyl and alanyl peptides ranging in molecular complexity from di- to hexa-peptides, the reaction mixture being in a substantially anhydrous state before the end of the reaction and the reaction being carried out at a temperature within the range of 90°–130° C. where the saccharide is a pentose; 120°–150° C. where the saccharide is selected from the group of hexoses and reducing polysaccharides; and 140°–170° C. where the saccharide is a non-reducing polysaccharide which is a precursor of a reducing saccharide.

2. The process of claim 1 in which the artificial chocolate flavor is developed by reacting the peptide with the reducing saccharide in the presence of an amino acid.

3. The artificial chocolate flavor produced according to the process of claim 1.

4. The artificial chocolate flavor produced according to the process of claim 2.

5. A process for producing an artificial chocolate flavor which comprises reacting a pentose with a member of the group consisting of glycyl and alanyl peptides ranging in molecular complexity from di- to hexa-peptides, the reaction being carried out at a temperature within the range of about 90°–130° C. and the reaction mixture being in a substantially anhydrous state before the end of the reaction.

6. A process for producing an artificial chocolate flavor which comprises reacting a reducing saccharide selected from the group consisting of hexoses and reducing poly-saccharides with a member of the group consisting of glycyl and alanyl peptides ranging in molecular complexity from di- to hexa-peptides, the reaction being carried out at a temperature within the range of about 120°–150° C. and the reaction mixture being in a substantially anhydrous state before the end of the reaction.

7. A process for producing an artificial chocolate flavor which comprises reacting a non-reducing polysaccharide with a member of the group consisting of glycyl and alanyl peptides ranging in molecular complexity from di- to hexa-peptides, the reaction being carried out at a temperature within the range of about 140°–170° C. and the reaction mixture being in a substantially anhydrous state before the end of the reaction.

8. A process for producing an artificial chocolate flavor which comprises reacting a saccharide with glycylglycine by the application of heat to a mixture of the reagents at an elevated temperature and for a time sufficient to produce said artificial chocolate flavor in a substantially anhydrous condition, said flavor producing reaction being carried out at a temperature in the range of 90°–130° C. where the saccharide is a pentose; 120°–150° C. where the saccharide is selected from the group consisting of hexoses and reducing polysaccharides; and 140°–170° C. where the saccharide is a non-reducing polysaccharide which is a precursor of a reducing saccharide.

9. A process for producing an artificial chocolate flavor which comprises reacting a saccharide with glycylalanine by the application of heat to a mixture of the reagents at an elevated temperature and for a time sufficient to produce said artificial chocolate flavor in a substantially anhydrous condition, said flavor producing reaction being carried out at a temperature in the range of 90°–130° C. where the saccharide is a pentose; 120°–150° where the saccharide is selected from the group consisting of hexoses and reducing polysaccharides; and 140°–170° C. where the saccharide is a non-reducing polysaccharide which is a precursor of a reducing saccharide.

10. A process for producing an artificial chocolate flavor which comprises reacting a saccharide with glycyl-alpha-amino-n-butyric acid by the application of heat to a mixture of the reagents at an elevated temperature and for a time sufficient to produce said artificial chocolate flavor in a substantially anhydrous condition, said flavor producing reaction being carried out at a temperature in the range of 90°–130° C. where the saccharide is a pentose; 120°–150° C. where the saccharide is selected from the group consisting of hexoses and reducing poly-saccharides; and 140°–170° C. where the saccharide is a non-reducing poly-saccharide which is a precursor of a reducing saccharide.

11. A process for producing an artificial chocolate flavor which comprises reacting a saccharide with glycyl-valine by the application of heat to a mixture of the reagents at an elevated temperature and for a time sufficient to produce said artificial chocolate flavor in a substantially anhydrous condition, said flavor producing reaction being carried out at a temperature in the range of 90°–130° C. where the saccharide is a pentose; 120°–150° C. where the saccharide is selected from the group consisting of hexoses and reducing polysaccharides; and 140°–170° C. where the saccharide is a non-reducing polysaccharide which is a precursor of a reducing saccharide.

12. A process for producing an artificial chocolate flavor which comprises reacting a saccharide with glycyl-leucine by the application of heat to a mixture of the reagents at an elevated temperature and for a time sufficient to produce said artificial chocolate flavor in a substantially anhydrous condition, said flavor producing reaction being carried out at a temperature in the range of 90°–130° C. where the saccharide is a pentose; 120°–150° C. where the saccharide is selected from the group consisting of hexoses and reducing polysaccharides; and 140°–170° C. where the saccharide is a non-reducing poly-saccharide which is a precursor of a reducing saccharide.

References Cited in the file of this patent

UNITED STATES PATENTS

2,103,495	Ruckdeschel	Dec. 28, 1937
2,179,203	Stein	Nov. 7, 1939

FOREIGN PATENTS

107,367	Great Britain	Mar. 18, 1918

EXHIBIT G

United States Patent [19]

Kleinert

[11] **3,769,030**

[45] **Oct. 30, 1973**

[54] **PROCESS FOR THE FABRICATION OF CHOCOLATE, ESPECIALLY MILK CHOCOLATE**

[75] Inventor: **Jurg Kleinert**, Zurich, Switzerland

[73] Assignee: **Chocoladefabriken Lindt & Sprungli Aktiengesellschaft**, Kilchberg, Switzerland

[22] Filed: **Dec. 22, 1970**

[21] Appl. No.: **100,803**

[30] **Foreign Application Priority Data**

Dec. 23, 1969 Switzerland..... 19164/69

[52] **U.S. Cl.**.....**426/45**, 99/26

[51] **Int. Cl.**..... **A23g 1/00**

[58] **Field of Search**..... 99/23, 26

[56] **References Cited**

UNITED STATES PATENTS

1,624,154	4/1927	Winckel	99/23
2,863,772	12/1958	Kempf	99/23
3,027,257	3/1962	Shenkenberg	99/26
2,457,110	12/1948	Burbank et al.	99/23
2,487,931	11/1949	Lataner	99/23
3,397,061	8/1968	Katz	99/23
2,899,309	8/1959	Rusoff	99/23

Primary Examiner—Robert L. Lindsay, Jr.
Assistant Examiner—Frederick Frei
Attorney—Waters, Roditi, Schwartz & Nissen

[57] **ABSTRACT**

A process for the fabrication of chocolate, especially milk chocolate is disclosed, wherein (a) cocoa is deodorized, (b) a carbohydrate-protein-additive mixture or carbohydrate-protein-additive-cocoa-mixture moistened with a carbohydrate solution is brought into reaction in at least one reactor at a temperature exceeding 50° C in order to form specific flavor and taste substances, the offensive smell and undesired volatile reaction products removed from the reaction mixture, and the reaction mixture is dried. While adding cocoa butter the cocoa treated according to step (a) is admixed with the carbohydrate-protein-additive-mixture or carbohydrate-protein-additive-cocoa-mixture treated according to step (b), plasticized and/or thinned, finely comminuted, and thereafter through the addition of fat and emulsifying agents is imbued or wetted with the fat phase and homogenized in a liquified condition.

9 Claims, No Drawings

PROCESS FOR THE FABRICATION OF CHOCOLATE, ESPECIALLY MILK CHOCOLATE

BACKGROUND OF THE INVENTION

The present invention relates to a new and improved process for the manufacture of chocolate wherein the development of the flavor or aroma is carried-out in a two-stage process, first with the cocoa, then with the carbohydrate-protein-additive-mixture or carbohydrate-protein-additive-cocoa-mixture. Consequently, it is possible to dispense with the conventional techniques for finally refining or finishing the chocolate mass, that is to say, by conching.

During chocolate manufacture the different constituents, such as the cocoa mass, sugar, cocoa butter and fragrance or flavor substances, in the case of milk chocolate additionally the milk constituents, as well as other additives, are intensively admixed with the maximum possible evolvement of the cocoa fragrance or flavor or aroma components, comminuted and homogeneously ground prior to forming the mass into bars.

After the pre-comminution and mixing operations, the chocolate mass is conventionally pre-milled in a so-called three roll-rolling mill, thereafter finely milled or rolled in a five roll-rolling mill. This technique is adequate for conventionally consumed or cooking-chocolate products and the fine milled mass is in condition for forming into single bars.

In the case of easily meltable chocolate, a final finishing operation, designated as conching in the art, was necessary. Conching is a mechanical treatment during which prevail temperatures in the range of 60° to 80° C. During conching there occur both physical and chemical changes in the chocolate mass.

Considered purely physically, the conching operation causes a phase reversal in the chocolate mass since the non-fatty substances are polished and completely encapsulated with a fatty film, resulting in the formation of a continuous fatty phase in the system. There is thus obtained a completely homogeneous mass possessing exceptional flavor and melting characteristics.

The chemical reactions primarily entail oxidation of the tannin remaining after fermentation and roasting of the cocoa beans. Furthermore, due to evaporation of the moisture there are removed volatile vapor components, such as acids, aldehydes and ketones. Additionally, reactions occur between the reducing substances and the amino acids as well as thermally promoted transformations of the sugar substances. The final refinement of the chocolate mass requires very high expenditure of energy and time, also necessitating a great deal of space. Hence, the economies of this production technique are quite disadvantageous. Accordingly, attempts have been made in the art to economize and rationalize the refinement processing of the chocolate melt.

According to a newly developed technique for the manufacture of chocolate, the conching operation is dispensed with because the dried beans after breaking and peeling are ground into a mass, this mass then is heated under pressure in a narrow gap-heat exchanger, thereafter to remove undesired odors it is expanded in a special chamber. This prior art technique is predicated upon the condition that the optimum temperature for the development of the flavor must be in the range of 140° to 160° C, very little flavor developing beneath 140° C while above 160° C the flavor is not very satisfactory. No observations will here be given concerning the taste of the new chocolate produced according to this prior art technique in comparison with the taste of conventional chocolate.

SUMMARY OF THE INVENTION

Accordingly, there is still existant in the art a real need for a rational and economical production technique for chocolate, which, while avoiding the expensive and time consuming conching operation, produces high-quality, good tasting chocolate. Therefore, a primary objective of the instant invention is to provide an improved process for the manufacture of chocolate which reliably and effectively fulfills the need existing in the art.

Still a further significant object of the present invention relates to an improved process for the manufacture of chocolate, especially milk chocolate, dispensing with conching and providing a chocolate product which is of high-quality, yet economical to manufacture, requiring a minimum of treatment time.

Another object of this invention relates to chocolate manufacturing techniques without conching, capable of manufacturing chocolate in a relatively simple, more rational and economical manner while still providing high-quality chocolate products.

DETAILED DESCRIPTION OF THE INVENTION

Now, to implement these and still further objects of the invention, which will become more readily apparent as the description proceeds, the inventive process for the fabrication of chocolate, especially milk chocolate, likewise dispenses with refinement of the chocolate by conching and is, generally speaking, manifested by the features that:

a. the cocoa is deodorized;

b. a carbohydrate-protein-additive-mixture or carbohydrate-protein-additive-cocoa-mixture moistened with a carbohydrate solution is brought to reaction in at least one reactor at a temperature exceeding 50° C for the purpose of forming specific flavor and taste substances, the offensive smell and/or undesired volatile reaction products are removed from the reaction mixture, the reaction mixture dried; and

c. the cocoa treated in accordance with step (a) is admixed with the carbohydrate-protein-additive-mixture or carbohydrate-protein-additive-cocoa-mixture treated according to step (b) while adding cocoa butter, this admixture is plasticized or liquified, finely comminuted, and thereafter imbued and homogenized in a liquidous condition while adding fat and emulsifiers.

It is preferable to deodorize the cocoa according to step (a) in such a manner that this cocoa is impregnated with a carbohydrate- and/or protein- and/or enzyme solution, and for the purpose of loosening the resultant structure and for forming the flavor- and taste substances is subjected to a chemical-physical and/or microbiological and/or enzymatic treatment, the undesired, offensive smell or volatile reaction products removed, and the reaction mixture dried. In this regard, the chemical-physical treatment of the impregnated cocoa is advantageously carried-out at a temperature of at least 50° C preferably greater than 100° C, and in particular above 115° C, and at an atmospheric pressure of up to 20 gauge pressure in atmospheres. The chemical-physical treatment of the impregnated cocoa,

if desired, should be undertaken subsequent to treatment with a buffer solution, after removing the air in a vapor atmosphere, and the subsequent drying of the reaction mixture deodorized according to the inventive process can occur by infra-red radiation.

It is advisable for enzymatic treatment that the cocoa mass produced from the deodorized cocoa, for the purpose of destroying the enzymes, as well as sterilization, be heated while continuously passing through a narrow gap heat exchanger to at least 120° C while excluding air.

The reaction according to step (b) proceeds in conventional fashion at a temperature exceeding 100° C, preferably greater than 110° C. The proportion of protein of the carbohydrate-protein-additive-mixture can be at least partially derived from cocoa or cocoa products, preferably are present in an amount of 1 to 20 percent by weight of the mixture. The expression "cocoa and/or cocoa products" as used in the context of this application is intended to denote all types of useable cocoa containing-starting materials, especially cocoa powder.

The additive used in the mixture of step (b) can be an inorganic or an organic salt, for instance magnesium carbonate, sodium chloride, ammonium carbonate and calcium phosphate, or an enzyme or mixture of enzymes. Instead of using one additive there can also be present a mixture of additives. In addition to the above mentioned substances, there also belong in this classification, for instance, natural or synthetic flavors or flavoring agents, spices, nutrient or cooking salts, emulsifying agents and amino acids. During the preparation of the carbohydrate-protein-additive-mixture both solid as well as liquid components may be used. The type of protein depends upon the type of chocolate which is to be made. In the case of milk chocolate, there is particularly added cream, full-cream milk, skim milk or whey in liquid or solid form. Advantageously, the portion which is in solution is sprayed on to the solid portion of the carbohydrate-protein-additive-mixture or carbohydrate-protein-additive-cocoa-mixture while continuously stirring or mixing. The homogeneously imbued mixture can then be brought to reaction in a thermal reactor by either a batch or continuous process and the volatile vapor components can be removed. The flavor formation can be controlled by temperature, time and layer thickness.

Depending upon the conditions which are used the formation of the flavor is based upon chemical reactions, either a Maillard reaction or caramelization. Both reactions are based upon the pronounced reduction capability of the mono-saccharide.

In contrast to caramelization, the Maillard reaction is dependent upon specific ingredients, the presence of glucose or fructose (fruit sugars), as well as free amino groups formed from proteins or amino acids. The reaction products resulting from the Maillard reaction, the so-called melanoids, are not only typical taste forming agents, but also pronounced coloring agents.

On the other hand, caramelization is independent of specific ingredients and primarily is based upon thermally dependent transformations of sugar substances. It is characterized by the formation of a number of generally brown to dark brown polymer dyes or coloring agents as well as aromatic compounds.

In the Maillard reaction, the formation of the flavor and coloring agents is decisively dependent upon the reaction conditions, such as temperature, moisture, pH-value, sugar materials, as well as protein compounds and amino acids. It is for these reasons that the flavor and taste components can be varied within wide limits with the inventive process.

During the impregnation of the cocoa with a carbohydrate solution it is recommended to use for steps (a) and (b) the same carbohydrate solution. Furthermore, the reaction mixture obtained during step (b) can subsequently be dried by infra-red radiation.

The reaction mixture of the deodorized cocoa obtained from treatment step (a) and the carbohydrate-protein-additive-mixture or carbohydrate-protein-additive-cocoa-mixture, obtained from treatment step (b), is treated with cocoa butter which is essentially free of odor and taste in a batch or continuous mixer to form a homogeneous and plastic, that is, millable or rollable basic chocolate mass.

The components processed into a homogeneous basic chocolate mass in the ingredient mixing stage are precomminuted and finely comminuted in a two-stage process in a roller mill. The size of the granules of the solid particles in the basic chocolate mass, after the fine grinding operation, should not exceed a microscopic image of 25μ (microns).

Following the fine milling operation, the basic chocolate mass is imbued and homogenized in a liquidous condition with an emulsifying agent- fat-mixture, especially an emulsifier-cocoa butter-mixture, in a special machine. The finished chocolate mass is thereafter precrystallized (tempered) in a manner conventional in the art, formed and packaged into chocolate bars consisting of individual squares or other small size chocolate products.

In contrast to the conventional techniques, the final refining step of the inventive technique only serves to imbue the non-fatty substances with the fat to achieve a homogeneous chocolate mass possessing good melting properties.

The invention will be more fully explained hereinafter in conjunction with a number of specific examples:

EXAMPLE I

To manufacture milk chocolate, the roasted cocoa nibs freed of the cocoa shell are introduced into a so-called cocoa nib reactor, then while continuously stirring are homogeneously wetted or impregnated with a fructose solution, and in a flowing water vapor stream is brought to reaction at 100° C and deodorized. Thereafter, in a continuous process, the moisture is removed to a residual moisture content beneath 2 percent, and thereafter in a two-stage operation processed into a cocoa mass. In order to eliminate the enzymes and for purposes of sterilization, this cocoa mass is then briefly heated to above 120° C during continuous passage through a narrow gap heat exchanger, and until it is further processed then stored in a tank having a heating jacket.

The components necessary for forming the carbohydrate-protein-additive-mixture are added into a mixture in the form of sucrose or saccharose, full-cream milk powder and skim milk powder, cooking salt, vanilla and cardamom and processed into a homogeneous friable mixture. This mixture is uniformly impregnated, while continuously stirred, with the same fructose solution used for impregnating the cocoa nibs, thereafter in a uniform flow is fed in fine agglomerated condition

into a flavor reactor, where at a temperature of 108° C it is brought to reaction and to a residual moisture content of beneath 1.5 percent, and then is introduced into a dry bunker.

The deodorized cocoa mass and the obtained carbohydrate-protein-additive-mixture are processed into a homogeneous mass, which while continuously mixing is plasticized into a rollable or millable mass while adding cocoa butter, then finely comminuted by rolling and imbued or wetted with the fat phase. Thereafter the finely comminuted and imbued basic chocolate mass is liquified by the addition of an emulsifying cocoa butter and formed into chocolate bars.

EXAMPLE II

For the manufacture of dark chocolate, there is again carried-out the first stage of the operation for deodorizing the cocoa in the same manner as described in conjunction with Example I. In the second stage, cocoa is additionally added to the carbohydrate-protein-additive-mixture in the mixer and the mixture is then processed in the manner described in Example I. The production of the chocolate from the deodorized cocoa mass and the prepared carbohydrate-protein-additive-cocoa-mixture likewise is performed in the manner described in conjunction with Example I.

EXAMPLE III

In order to carry-out an enzymatic treatment, the cocoa nib mixture is homogeneously impregnated in a mixer with a reaction solution containing up to 15 percent by weight glucose, 5 percent by weight magnesium carbonate, 1 percent by weight of a lipase-amylase-proteaseenzyme solution and 79 percent by weight water. After 50 minutes acitivity at 40° C the mixture is dried in a continuous through-passage dryer to a residual moisture content beneath 1.5 percent and processed together with the treated carbohydrate-protein-additive-mixture into chocolate.

By way of completeness it is here mentioned that the upper temperature limit for the process steps (a) and (b) amounts to approximately 150° C. Suitable examples of the buffer materials which may be used in the practice of the invention are, sodium titrate buffer, phosphate buffer, acetic acid. Apart from cocoa butter, there may also be used as the fat peanut fat, coberine fat, calvetta fat and illaxao fat. Also, it is here mentioned that as the emulsifying agents or emulsifiers there can be used e.g., lecithin or glycerine monostearate. Suitable further examples of the carbohydrate or carbohydrate solution, apart from fructose, are saccharose, galoctose, and glucose, for instance.

While there is described present preferred embodiments of the invention, it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied and practiced within the scope of the following claims.

What is claimed is:

1. A method for the manufacture of chocolate paste, especially milk chocolate paste, wherein cocoa is deodorized and a paste obtained from the deodorized cocoa is finished without conching, the method comprising the following steps:

1. impregnating broken, shell-free, roasted cocoa kernel with an aqueous solution of mono- or disaccharides which may further contain amylolytic and proteolytic enzymes, heating the mixture, after having been stored at 40° C if enzymes are present, to a temperature of at least 50° C. to about 150° C. in order to develop flavoring substances, then treating the heated mixture with a water vapor stream to eliminate bad smelling compounds, and finally drying the water vapor treated mixture after destruction by sterilization of any enzymes present;
2. impregnating a second mixture comprising
   a. mono- or disaccharides,
   b. protein-containing edible components and
   c. at least one food additive selected from the group consisting of flavoring agents, spices, salts, emulsifiers and amino acids,

with an aqueous solution defined under (1) above, heating said impregnated second mixture in a reactor at a temperature exceeding 100° C. to about 150° C. and drying said heated impregnated second mixture; and

3. mixing together the mixtures obtained in steps (1) and (2) with the addition of cocoa butter to form a final mixture, plasticizing said final mixture, and liquefying and wetting said plasticized final mixture by the addition of an edible emulsifier and a vegetable fat.

2. The method of claim **1**, wherein the same impregnating solution is used in steps (1) and (2).

3. A method as claimed in claim **1**, wherein the drying in step (1) is effected by infra-red radiation.

4. A method as claimed in claim **1**, wherein the heat treatment in step (1) of cocoa impregnated with an enzyme-free monosaccharide or disaccharide solution is effected at a pressure in the range from atmospheric pressure up to 20 atmospheres gauge.

5. A method as claimed in claim **1**, wherein the heat treatment in step (1) of cocoa impregnated with an enzyme-free monosaccharide or disaccharide solution occurs, after removing the air, in a water vapor atmosphere.

6. A method as claimed in claim **1**, wherein the sterilization in step (1) is effected by continuously passing the water vapor treated mixture at a temperature of at least 120° C through a heat exchanger of the narrow gap type while excluding air.

7. A method as claimed in claim **1**, wherein the heat treatment of step (2) is effected at a temperature exceeding exceeding 110° C.

8. A method as claimed in claim **1**, wherein the heat treatment in step (1) of cocoa impregnated with an enzyme-free monosaccharide solution is effected at a temperature of at least 100° C.

9. A method as claimed in claim **8** wherein the temperature in step (1) is greater than 115° C.

* * * * *

EXHIBIT H

US005676993A

United States Patent [19]

Watterson et al.

[11] Patent Number: 5,676,993

[45] Date of Patent: Oct. 14, 1997

[54] **PROCESS OF PRODUCING CACAO FLAVOR BY ROASTING COMBINATION OF AMINO ACIDS AND REDUCING SUGARS**

[75] Inventors: **Julia J. Watterson**, Hummelstown; **Kenneth B. Miller**, Palmyra; **Joseph J. Furjanic**, Hummelstown; **David A. Stuart**, Hershey, all of Pa.

[73] Assignee: **Hershey Foods Corporation**, Hershey, Pa.

[21] Appl. No.: **476,703**

[22] Filed: **Jun. 7, 1995**

[51] **Int. Cl.**[6] **A23L 1/22**; A23L 2/56

[52] **U.S. Cl.** **426/533**; 426/534; 426/536; 426/537; 426/631; 426/650; 426/658

[58] **Field of Search** 426/533, 534, 426/536, 537, 538, 650, 631, 615, 658, 660, 465, 466

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,547,377	10/1985	Ogawa et al. .	
4,735,812	4/1988	Bryson et al. .	
4,940,592	7/1990	Byrne et al. .	
5,041,296	8/1991	Byrne et al. .	

FOREIGN PATENT DOCUMENTS

239942A1	10/1987	Germany .

OTHER PUBLICATIONS

Mohr, W. et al. *Fette Seifen Anstrichmuttel,* No. 8, pp. 515–521 (1971).

Darsley, R.R. and V.C. Quesnel, *J. Sci. Fd Agric.* 23:215–225 (1972).

T.A. Rohan, *DECHEMA* (Deut. Ges. Chem. Apparatew.), vol. 70, pp. 301–21 (1972).

Code of Federal Regulations, No. 21, Part 14, Cacao Products (Apr. 1, 1974).

Foster, Herbert, *The Manufacturing Confectioner,* pp. 51–59 (May, 1978).

Lane, M.J. and H.E. Nursten, *ACS Symposium Series* vol. 215, pp. 141–157 (1983).

Ney, K.H. *gordian* 85(5): 88–92 (1985).

Zoumas, B.L. and E.J. Finnegan, "Chocolate and Cocoa", *Kirk–Othmer Encyclopedia of Chemical Technology,* vol. 6 (3rd. Ed., Wiley–Interscience, New York) pp. 1–19 (1985).

Arnoldi, A. et al., *J. Agric. Food Chem.* 36: 988–992 (1988).

Rizzi, George, P., *Thermal Generation of Aromas,* Chapter 16, pp. 172–181 (Sep. 1989).

Federal Register, vol. 56, No. 153 (Aug. 8, 1991).

Smith, Robert E., et al. *J. Agric. Food Chem.* 42: 432–434 (1994).

Primary Examiner—Leslie Wong

Attorney, Agent, or Firm—Scully, Scott, Murphy & Presser

[57] **ABSTRACT**

The present invention is directed to a means of enhancing the cocoa flavor to a fat matrix by adding thereto about 0.3 g to about 4.0 g phenylalanine, 0.75 g to about 2.0 g leucine, and about 0.5 g to about 3.0 g reducing sugar and optionally about 0.05 g to about 0.8 g alanine for each 100 g of unroasted fat matrix and roasting the same, and to the products produced therefrom.

56 Claims, No Drawings

PROCESS OF PRODUCING CACAO FLAVOR BY ROASTING COMBINATION OF AMINO ACIDS AND REDUCING SUGARS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention is directed to a process for enhancing the cacao flavor or more generally the organoleptic properties of various food products including the confectionery products made from inferior or lower quality cocoa beans. This is accomplished by roasting a combination of free amino acids and reducing sugars in a fat matrix, e.g., cocoa liquor base containing cocoa liquor derived from the inferior beans or by nib roasting the inferior cocoa beans. The product so obtained may be used in cocoa and chocolate products as well as for flavoring in other food products.

2. Description of the Prior Art

In the processing of foodstuffs for human consumption, a critical component to any product is its flavor. Flavor comprises three principal characters, namely tactual, gustatory and olfactory, or feel, taste and smell. The tactual component concerns the feel or texture of the food in the mouth (e.g. smooth, chewy, fluid, etc.) while the gustatory component concerns astringency and the sensations which are detected on the tongue (e.g. salt, sweet, sour, bitter, etc.). The olfactory component involves the smell of the foodstuff and comprises the odor of the foodstuff, which is perceived on smelling the food, and the aroma of the foodstuff, which is sensed by the olfactory receptors while the food is being chewed.

Basically, each of the five basic senses of sight, touch, smell, hearing and taste are involved in flavor appreciation. Consequently, to only consider the odor produced when foods are processed would be a foolish restriction to only part of the flavor pattern. It is well known that foodstuffs, such as beef, develop desirable flavor characteristics upon cooking and that these characteristics are due to the presence of a compound or compounds which undergo a chemical reaction during processing. These compound or compounds have become known as "flavor precursors" and many attempts have been made to isolate them from unprocessed foodstuffs and to identify the important compounds in hopes of duplicating a particular flavor. Among the foods whose precursors have been studied are chocolate.

Extensive studies of the fermentation of cocoa beans have shown that the enzymatic hydrolysis of cocoa proteins leads to the release of free amino acids and short peptides. It has been generally assumed that these short peptides and/or free amino acids react with reducing sugars during cocoa bean or liquor roasting to form, through Malliard-type reactions, cacao flavor and aroma compounds.

For example, R. R. Darsley, et al., *J. Sci. Fd Agric.* 23: 215–225 (1972) discussed the mechanism involved in roasting cocoa beans and the production of aldehydes from the amino acids in the roasted cocoa. A. Arnoldi, et al., *J. Agric. Food Chem.* 36: 988–992 (1988) studied the Malliard reaction in cocoa beans through the use of a model system in cocoa butter and particularly looked at the formation of pyrazines obtained from reacting eight different amino acids known to be present in cocoa beans with fructose, one of the most abundant sugars in cocoa beans.

Several processes for producing cacao-like aroma and/or flavor based on a thermal reaction between amino acids or peptides and sugars have been described. German patent (DD) no. 239,942 to the Academy of Sciences of the GDR

described a process for the production of cocoa aromatic compounds by thermally reacting a partial protein hydrolysate such as gelatin with a sugar while maintaining the water content within very narrow parameters.

Chocolate-like aromas have also been produced by heating together valine, leucine, glucose and epicatechine as shown by T. A. Rohan and T. F. Stewart, *The British Manufacturing Industries Research Association Research Reports*, No. 145, pp. 1–35 (1969). Similarly, the production of chocolate-like aromas was disclosed by Herbert Foster in *The Manufacturing Confectioner*, pp. 51–59 (May, 1978) by heating together threonine or valine with glucose and by M. J. Lane and by H. E. Nursten in *ACS Symposium Series* V215, pp. 141–157 (1983) by heating together serine or tyrosine with glucose.

It has been reported that fructose played a greater role than glucose, as did valine, leucine and phenylalanine with regard to other amino acids, in the development of cocoa aroma. However, although a roasted synthetic mixture of these precursors was found to have a chocolate odor, it did not possess the subtlety and complexity of a cocoa aroma.

Although the above-noted references were successful in the production of chocolate-like aroma, none of the systems produced or enhanced cacao flavor. K. H. Ney, *Gordian* 85(5): 88–92 (1985) disclosed the production of cocoa flavor by the heating of mixtures of fructose, and equal concentrations of leucine, valine and phenylalanine. However, the cocoa flavor produced was weak. The authors did not recognize that valine was not essential to produce cocoa flavor and that an enhanced flavor could be produced if the amount of phenylalanine present is increased.

In a somewhat similar fashion, U.S. Pat. No. 4,940,592 and 5,041,296 to Byrne et al. describe a process for the formation of chocolate flavor by microwave cooking leucine, phenylalanine and sugar in a solvent such as propylene glycol or glycerine, or mixtures thereof and water. However, they do not add the leucine, phenylalanine and sugar directly to a fat matrix. For example, Byrne, et al. did not add the leucine, phenylalanine, and sugar mixture directly to unroasted chocolate liquor or to cocoa nibs, especially cocoa nibs of inferior quality. They specifically teach that the reaction between the sugars and the amino acids cannot take place in aprotic solvents, such as vegetable oil, thereby teaching away from a procedure for increasing cocoa flavor in a fat matrix, such as chocolate. Furthermore, when applicants roasted this combination in the amounts indicated in Byrne, et al. in a chocolate compatible, high lipid matrix such as cocoa liquor, the aroma and flavor generated did not resemble cacao to a high degree.

Consequently, it is desirous to obtain a system which, when roasted in the presence of reducing sugars in a lipid-based, chocolate compatible system, including vegetable-oil based fat matrices, (such as chocolate liquors, cocoa butter, cocoa butter equivalents or cocoa butter substitutes, and the like) will yield and/or enhance cacao flavor and aroma.

Sensory analyses by trained chocolate liquor panelists have shown that cacao flavor is one of the most important flavor attributes affecting the flavor quality of cocoa beans. The cacao intensity of most chocolate liquors ranges from 4–7 on a 0–15 numeric scale. Cacao flavor is largely determined by the cocoa bean fermentation process. Improper fermentation (either too little or too much) can yield poor cacao flavor.

The presence of off-flavors also plays a major role in determining the overall flavor quality because they detract

and/or mask the desirable cacao flavor. Some of the more common off-flavors include: sour, putrefaction, smoky, and musty. Most of these undesirable flavor notes are a result of improper processing of cocoa beans either during the fermentation, drying or storage steps. For example: 1) overfermented beans can develop sour, putrefied notes, 2) smoky flavors occur when beans are dried over an open flame, and 3) musty flavors are produced when beans are stored under high moisture conditions.

There are different grades of cocoa beans which produce different flavor grades of chocolate liquor. At the high quality extreme, there are cocoa beans producing chocolate liquor with high cocoa flavor (6–7 range) and minimal off-flavors. At the low extreme, there are cocoa beans producing chocolate liquor having higher off-flavors and minimal cacao flavor (4–5 range). There are also cocoa beans of intermediate quality which can have either moderate cacao flavor (5–6 range) and off-flavors or low cacao flavor (4–5 range) and off-flavors.

The best chocolates are produced from the highest flavor quality cocoa beans. However, the highest quality cocoa beans can also be the most expensive, while the poorest quality cocoa beans are less expensive. In order to reduce the costs of manufacturing chocolate, it would be desirable to enhance cacao flavor in order to utilize more of the less expensive beans without sacrificing flavor quality. This is one of the main objectives of the present invention.

The present inventors have found such a system that has considerably enhanced the cacao flavor of chocolate liquor produced from cocoa beans of lower flavor quality.

SUMMARY OF THE INVENTION

The present invention is directed to a means of enhancing cocoa flavor in fat matrices normally utilized in making chocolates such as unroasted cocoa nibs or unroasted chocolate liquor, cocoa butter equivalents or cocoa butter substitutes by adding sufficient amounts of phenylalanine and leucine and a reducing sugar (hereinafter "amino acid/sugar mixture") to an unroasted fat matrix so that when roasted, the sugar and amino acid react to produce an enhanced cocoa flavored product, and roasting the fat matrix containing the amino acid/sugar mixture. In an embodiment of the present invention, the present invention is directed to a means of enhancing cocoa flavor in chocolate produced from cocoa beans of lower quality by adding sufficient amounts of phenylalanine and leucine and a reducing sugar (hereinafter "amino acid/sugar mixture") to unroasted chocolate liquor or unroasted cocoa nibs from inferior cocoa beans so that when roasted, the sugar and amino acid react to produce an enhanced cocoa flavored product, and roasting the amino acid/sugar containing chocolate liquor or cocoa nibs. For example, the present invention encompasses a process for enhancing the cocoa flavor by adding to every 100 g of said unroasted fat matrix about 0.3 g to about 4.0 g phenylalanine, about 0.3 g to about 2.0 g leucine, wherein the ratio of phenylalanine to leucine is at least 1.25 (w/w) and about 0.5 g to about 3.0 g reducing sugar and (b) roasting the product of (a). The present invention is also directed to mixing about 0.3 g to about 4.0 g phenylalanine, about 0.3 g to about 2.0 g leucine, such that the ratio of phenylalanine to leucine is at least 1.25 w.w, and about 0.5 g to about 3.0 g reducing sugar with that amount of cocoa nibs obtained from inferior cocoa beans that would generate each 100 g of unroasted chocolate liquor in sufficient amount of solvent, preferably water, for the amino acid/sugar mixture to be fully absorbed by the cocoa nibs, and roasting the same. The present invention also encompasses these roasted products. It is also directed to a flavor precursor composition comprising about 0.3 g to about 4.0 g phenylalanine, about 0.3 g to about 2.0 g leucine, such that the weight ratio of phenylalanine to leucine is at least 1.25 and about 0.5 g to about 3.0 g reducing sugar per each 100 g of unroasted fat matrix, especially chocolate liquor obtained from inferior cocoa beans. It is also directed to the modified cocoa nibs, i.e, the cocoa nibs that have absorbed the amino acid/sugar mixture defined hereinabove and to the chocolate liquor obtained from the modified cocoa nibs. Finally, the present invention is directed to the process of making confectionery products using the roasted fat matrix prepared in accordance with the present invention and the chocolate confectionery product produced therefrom.

However, another embodiment of the present invention is the addition of alanine to the amino acid/sugar mixture. The presence of alanine provides a mediative influence on taste parameters such that the composition may employ a much broader range of the ratio of phenylalanine to leucine, while achieving the benefits of the invention. Thus, if alanine is present, there is no restriction upon the ratio of phenylalanine to leucine. The present invention is also directed to the process of enhancing cocoa flavor in fat matrixes, including cocoa liquor and cocoa nibs obtained from inferior quality cocoa beans, and to the flavor precursors, and the chocolate products produced therefrom.

DETAILED DESCRIPTION OF THE INVENTION

As used herein, the term "fat matrix", when used in either the singular or plural form, refers to a vegetable oil that is used in making confectionery products. Examples include cocoa butter, chocolate liquor derived from cocoa beans, cocoa butter substitutes, cocoa butter equivalents, and the like. As used herein, the fat matrix also refers to cocoa nibs. It is to be understood to one skilled in the art that fat matrices exclude those oils which are not used in making confectionery products, such as cooking oils, salad oils, and the like. It also excludes glycerine and propylene glycol or mixtures thereof or mixtures of glycerine or propylene glycol with ethanol.

Unless specified to the contrary, the weights produced in the specification are per 100 g of fat matrix. If the fat matrix are cocoa nibs, then the "weight" refers to that amount of cocoa nibs that would generate 100 grams of unroasted chocolate liquor.

Cocoa butter substitutes and equivalents are terms of art well known to the skilled artisan. Cocoa butter equivalents are chemically similar to cocoa butter and can replace cocoa butter in any proportion without any harmful effects. Cocoa butter substitutes do not chemically resemble cocoa butter, but are compatible with cocoa butter within specific limits.

Both cocoa butter substitutes and equivalents are manufactured from different sources of fats and by different processes. Cocoa butter substitutes are produced from lauric acid fats such as coconut, palm and palm kernel oils by fractionation and hydrogenation, and from domestic fats such as soy, corn, and cotton seed oil by selective hydrogenation or from palm kernel stearines by fractionation. On the other hand, cocoa butter equivalents are produced from, inter alia, palm kernel oil and other specialty fats such as shea and illipe by fractional crystallization or from edible beef tallow by acetone crystallization.

Examples of cocoa butter equivalents include COBERINE® (vegetable oil from palm and shea),

CHOCLIN™ (vegetable oil from palm and shea) and the like. Examples of cocoa butter substitutes include CAPRENIN® which is the common name for caprocaprylobehenin, SALATRIM®, which is a family of triacylglycerols having the physical properties of fat but with approximately half the calories, produced by the interesterification of highly hydrogenated vegetable oils with triacylglycerols of acetic, propionic and/or butyric acids.

An aspect of the present invention is to improve the cocoa flavor of a fat matrix by adding thereto the amino acid/sugar mixture of the present invention, as defined hereinabove. When the amino acid/sugar mixture is added to the fat matrix before roasting, it is referred to as "the preflavor composition".

Another aspect of the present invention is in improving the cacao flavor and organoleptic properties of inferior or lower quality cocoa beans. By "inferior or lower quality cocoa beans," it is meant cocoa beans which do not have a high cocoa flavor, e.g., from cocoa beans giving rise to a low rating by a panel of experts who specialize in taste testing chocolates. Obviously, the amino acid/sugar mixture of the present invention would have the greatest effect on the cocoa beans or the chocolate liquor having the poorest ratings, i.e., 4–5 cacao rating, by impregnating the cocoa nibs or liquor from these cocoa beans with the amino acid/sugar mixture of the present invention. The cacao flavor of the cocoa bean or liquor is greatly enhanced after roasting. In addition, the amino acid/sugar mixture of the present invention is effective in enhancing the cacao flavor of the cocoa bean of intermediate quality or the chocolate liquor produced therefrom having an intermediate rating (e.g., 5–6). Although the amino acid/sugar mixture of the present invention also enhances the cacao flavor of cocoa beans or chocolate liquor of the highest quality, in most cases, it is not practical or necessary to impregnate these cocoa nibs or their liquor since they have a high cocoa flavor in the first instance. Unless specified to the contrary, as used herein, "inferior cocoa beans" will refer to cocoa beans producing a liquor or the liquor itself having a cacao rating of below 6.

"Chocolate liquor", as used herein, is a term of art well known in the chocolate industry. It is the solid or semiplastic food prepared by finely grinding the kernel or nib of the cocoa bean. Normally, chocolate liquor is prepared by undergoing various processes; i.e., cleaning, winnowing, roasting and grinding. Each of these steps are generally discussed hereinbelow.

The first step in the process of making chocolate liquor is cleaning the cocoa bean and removing foreign objects therefrom. The foreign objects may be stones, metals, twigs, twine or other matter which are mixed in with the cocoa bean or matter that adheres to the cocoa bean, such as sand and dirt.

The cocoa beans next normally undergo a roasting step. This is the step where chocolate flavor is normally developed. It is essentially a cooking step which promotes reactions of the latent flavor precursors, such as the proteins, amino acids, reducing sugars, tannins, organic acids and other unidentified compounds in the cocoa bean to form products which are highly flavored.

Roasting conditions are adjusted to produce different types of flavor. For example, low, medium, full and high roasts are produced by varying temperature, humidity and amount of time in the roaster. For instance, a high roast produces strong flavors and dark color, while a low roast produces mild flavors and light color. Roasting temperatures vary from 70° C. to 180° C. while roasting time tends to vary from about 30 to 60 minutes.

Winnowing, the next step in the process, is the process of separating the nib or kernel from the inedible shell. This is an important operation since the failure to adequately remove the nib from the shell produces chocolate products which are lower in quality.

The final step is the grinding of the kernel or nib of the cocoa bean. The nib is a cellular mass which contains 50–56% cocoa fat. The grinding steps liberate the fat locked within the cell wall.

These processes described hereinabove are performed under conventional conditions known to one skilled in the art and produce chocolate liquor.

The term, "unroasted chocolate liquor", is the cocoa mass that is formed in accordance with the procedure described hereinabove when the roasting step is omitted. In other words, the cocoa bean is cleaned, winnowed and ground in accordance with conventional techniques, but does not undergo the roasting step.

The unroasted chocolate liquor described herein may be pretreated prior to being roasted. The pretreatment may consist of extracting the winnowed cocoa nibs with water or other solvent. In this process, caffeine and cocoa flavor precursors may be removed. The decaffeinated cocoa beans are then ground in accordance with conventional techniques to produce a decaffeinated chocolate liquor with inferior cacao flavor.

Unless specified to the contrary, the term, "unroasted chocolate liquor" encompasses the unroasted chocolate liquor that has not undergone pretreatment, as described hereinabove. If reference is made to the "pretreated chocolate liquor" the term "pretreated or extracted chocolate liquor" will be utilized.

As described hereinabove, an embodiment of the present invention is directed to impregnating a chocolate liquor from an inferior cocoa bean or the cocoa nib from an inferior cocoa bean with phenylalanine and leucine and a reducing sugar (referred to herein as the "amino acid/sugar mixture") and roasting the impregnated liquor or cocoa nibs to produce a cocoa flavored liquor. Embodiments of the present invention include the preflavor composition containing unroasted chocolate liquor, phenylalanine, leucine and optionally alanine and a reducing sugar, and the product derived from roasting.

By the term "reducing sugar", it is meant a sugar having a free aldehyde or keto group, capable of reducing indicators, such as the cupric ion (Cu^{2+}) complexes to the cuprous form (Cu^{+}). Examples of reducing sugars that can be utilized in the preflavor composition of the present invention include erythrose, ribose, arabinose, allose, altrose, glucose, mannose, threose, xylose, lyxose, gulose, idose, galactose, talose, erythrulose, ribulose, xylulose, psicose, fructose, sorbose, tagatose, and the like. The preferred reducing sugars are monosaccharides, especially aldoses or ketoses having 5 or 6 carbon atoms. It is even more preferred that the reducing sugar is fructose, arabinose and especially glucose. The most preferred sugars are fructose and especially glucose. In fact, the present inventors have found that fructose produces a more intense taste, although it may also simultaneously increase the off-tastes.

The preflavor composition of the present invention must contain at least one reducing sugar; however, it may also contain more than one reducing sugar. For example, it may contain both glucose and arabinose. It is preferred that the precursor composition contain no more than four reducing sugars, and more preferably no more than three reducing sugars and most preferably no more than one or two different reducing sugars.

The reducing sugars may be present in various stereoisomeric forms, i.e., D, L or mixtures of D or L, including racemic mixtures. All of these forms and combinations thereof are contemplated by the present invention. However, it is preferred that the reducing sugar be in the D form or the racemic form, and more preferably, in the D form. If more than one reducing sugar is present, it is preferred that at least one of the reducing sugars is in the D or racemic form, and it is most preferred that all of the reducing sugars present are in the racemic or D form. Examples include, D-glucose, D-fructose, D arabinose, D, L arabinose, and the like.

The reducing sugar is present in the preflavor composition in amounts effective to react with the amino acids in the preflavor composition of the present invention to produce cocoa flavor.

Unless specified to the contrary, all of the weights given hereinbelow are per 100 g of the fat matrix.

It is preferred that the reducing sugar be present in amounts ranging from about 0.5 g to about 3.0 g, more preferably from about 0.75 g to about 2.0 g, and most preferably from about 0.75 g to about 1.5 g.

It is preferred that the ratio of total amino acid to reducing sugar added to the unroasted chocolate liquor ranges from about 0.2 to 3.00 (w/w) and more preferably from 1.00 to 2.75, and even more preferably, from 1.5 to 2.50 and especially more preferably from 1.75 to about 2.25 (w/w) and most preferably, the ratio is about 2:1 (w/w).

If more than 1 sugar is present, it is preferred that at least one of the sugars is glucose, fructose or arabinose, and even more preferred that the reducing sugar is a mixture of any two of glucose, fructose and arabinose and most preferably, a mixture of all three sugars, wherein the total amount of sugar present is within the ranges given above. When more than one sugar is present, it is preferred that the various sugars be present in about equal amounts (w/w) except for fructose. When fructose is present, it is preferred that there be 2–3 times more fructose present than the other sugars (w/w).

The other component in the preflavor precursor composition of the present invention is the amino acid component.

The amino acids that must be present in the preflavor composition of the present invention are leucine and phenylalanine. These amino acids should be present in effective amounts to react with the reducing sugars during the roasting step to produce cocoa flavor. The amount of phenylalanine present in the preflavor composition preferably ranges from about 0.3 g to about 4 g, more preferably from about 0.75 g to about 2.5 g and most preferably from about 1.00 g to about 2.0 g. Leucine is preferably present in amounts ranging from about 0.3 g to about 2 g and more preferably from about 0.3 g to about 1.5 g and most preferably from about 0.5 g to about 1.25 g. When the amino acids in the amino acid/sugar mixture in the preflavor composition do not contain any alanine, then the ratio of phenylalanine to leucine (w/w) is at least 1.25, and more preferably 1.50 and most preferably at least 1.5–6.0. However, if alanine is added, the ratio of phenylalanine to leucine ratio by weight is not critical. Thus, when alanine is present, the ratio may be below 1.25, although even in this embodiment it is preferred that the ratios are as indicated hereinabove. Alanine, when added to the preflavor composition is preferably present in amounts ranging from about 0.05 g to about 0.80 g and even more preferably from about 0.08 g to about 0.70 g and most preferably from about 0.1 g to about 0.5 g.

In the preferred embodiment, the amount of phenylalanine present is correlated with the amounts of alanine present, i.e., the amount of alanine present is at a lower or equal relative level of its range relative to that of phenylalanine. For example, when the amount of phenylalanine present is high, the amount of alanine present is either at low, moderate, or high levels of its range. However, when the phenylalanine is present at low levels, then alanine is also present in the lowest amounts.

In this case, high levels of phenylalanine are greater than about 2.0 g of phenylalanine per 100 g of fat matrix, while low levels are less than 0.75 g/100 g of fat matrix. Low levels of alanine are 0.25 or less alanine per 100 g of fat matrix, moderate levels are 0.25–0.50 g of alanine per 100 g of fat matrix, and high levels of alanine are at greater than 0.50 g per 100 g of fat matrix.

In addition, in preferred embodiments, the amount of phenylalanine present exceeds the individual amounts of alanine when present, and leucine (w/w). In even more preferred embodiments, the amount of phenylalanine present exceeds the sum of the amount of leucine and alanine, when present.

It is also preferred that the amount of phenylalanine present is about the same as or is greater than the amount of sugar present. In an even more preferred embodiment, the amount of phenylalanine present ranges from about 1.0 to about 2 times the amount of sugar present and more preferably from about 1.0 to about 1.5 times the amount of sugar present (w/w).

In addition, in preferred embodiments, the amount of leucine exceeds the amount of alanine, when present. In an even more preferred embodiment the amount of phenylalanine exceeds the sum of the amounts of alanine and leucine present (w/w) and the amount of leucine exceeds the amount of alanine present (w/w). In a preferred embodiment the amount of leucine present is about 2.5 to 6 times greater than the amount of alanine used (w/w). In another preferred embodiment it is preferred that the amount of phenylalanine utilized is about 5–7.5 times greater than the amount of leucine utilized (w/w).

Besides the aforementioned amino acids, other amino acids may additionally be present. These other amino acids include the twenty naturally occurring amino acids. It is preferred that these additional amino acids have a basic side chain, such as in histidine, lysine, or arginine, an aromatic side chain, such as in tyrosine, or aliphatic side chain, such as valine or isoleucine. In an even more preferred embodiment, the additional amino acids are added to the composition containing alanine, phenylalanine, leucine and a reducing sugar as described here.

In an embodiment, the preflavor composition of the present invention contains at least one additional amino acid; it may contain as many as 8 additional amino acids, although it is preferred that no more than four additional amino acids are present. In fact, as few as one additional amino acid may be present in the preflavor composition of the present invention. The preferred additional amino acids include tyrosine, arginine, valine, isoleucine, and lysine. Of these, the most preferred amino acid is tyrosine.

If additional amino acids are present, it is preferred that the total amount of these additional amino acids range from 0.5–2.0 g per 100 g and more preferably from 0.8 to 1.5 g per 100 g of fat matrix.

When present, it is preferred that the amount of tyrosine ranges from about 0.03 to about 1.5 g per 100 gm of fat matrix and more preferably from about 0.06 to 1.0 g. The preferred amount of arginine, when present ranges from about 0.03 to about 0.4 g per 100 g of fat matrix and more

preferably from about 0.05 to about 0.3 g; while the preferred amount of valine, when present, ranges from about 0.1 to about 0.7 g per 100 g of fat matrix, and more preferably, from about 0.2 to about 0.5 g. When present, it is preferred that the amount of lysine ranges from about 0.1 to about 0.75 g per 100 g of fat matrix and more preferably from about 0.2 to about 0.5 g and that isoleucine, when present, ranges from about 0.02 to about 0.3 g per 100 g of fat matrix and more preferably from about 0.04 g to about 0.09 g per 100 g of fat matrix.

The various amino acids mixed in the preflavor composition may exist in various stereoisomeric forms, D L or mixtures thereof, including racemic mixtures. It is preferred that the amino acids be in the racemic form and more preferably in the L form.

The preflavor composition of the present invention encompasses all of the combinations and permutations of the various components listed hereinabove, including the percentages indicated herein.

The amount of fat matrix used is dependent upon the amount of chocolate that is being produced as well as the type of chocolate being produced. This amount is easily calculable by one skilled in the art.

When the amino acid/sugar mixture is added to unroasted fat matrix such as chocolate liquor, it is thoroughly mixed. After these components are thoroughly mixed, the mixture is then roasted, i.e., cooked. The roasting step is in accordance with conventional methods used to roast cocoa nibs and/or liquor. The reaction mixture is roasted at conventional temperature to effectuate and complete the flavoring reactions, such as the Malliard reactions, Amidori rearrangement, the Strecker degradation, and other chemical reactions between the sugar and the amino groups of the amino acids and proteins to form a flavor compound, such as pyrazines. In addition, other chemical reactions occur during the roasting step, such as the removal of unpleasant volatile acids and astringent compounds, partial breakdown of the sugars, modifications of the tannins, reactions promoting color changes of the liquor, and formation of other nonvolatile compounds with the concomitant reduction in bitterness, and the like.

The amino acid/sugar mixture is either liquor roasted or flake roasted with the fat matrix using conventional techniques. Liquor roasting involves heating the fat matrix, e.g., chocolate liquor, plus precursors in an enclosed vessel while stirring the mixture. Flake roasting involves first refining the unroasted fat matrix and the flavor precursors under cold conditions to form thin sheets of liquor called flakes. These flakes are then spread onto a baking screen, and the flavor is developed in an oven. Alternatively, if the fat matrix is cocoa nibs, the cocoa nibs are infused with the amino acid/sugar mixture, and then undergo the process of nib infusion roasting. In this method, the raw cocoa nibs are not ground into a liquor and refined before roasting. Instead, to incorporate the amino acid/sugar mixture into the nib, the amino acids and sugars are added into sufficient amounts of aqueous solvent, preferably water, until dissolved. The nibs are immersed in this aqueous infusion solvent, e.g., soaked, in the amino acid sugar solution at slightly elevated temperatures, such as about 50° C., for sufficient time until they absorb the water. Usually this takes approximately one hour. After the soaking step, the nibs typically have a moisture content of about 25–40% and preferably about 30% (w/w). Optionally, the nibs are oven dried at sufficient temperature and for sufficient time to substantially lower the moisture content, preferably to less then about 10%, and even more preferably to about 5% (w/w). Again, the temperature of the oven is at slightly elevated temperatures, such as about 50° C., and this drying step usually takes at least an hour. The nibs are then roasted in a nib roaster at sufficient temperature and for sufficient time to develop flavor. For example, in a preferred embodiment, the nibs are roasted for one to eight minutes at an air temperature of approximately 165° C. The nibs are then cooled. Optionally, they are then ground refined to make chocolate liquor.

Thus, the unroasted chocolate fat matrix, such as chocolate liquor or unroasted cocoa nibs, contains or absorbs, respectively, effective amounts of sugar molecules and amino acids in order to promote, enhance and/or effectuate the reactions described hereinabove, especially the flavoring reactions, thereby producing a roasted matrix having enhanced cocoa flavor.

It has been observed by the present inventors that the addition of the amino acid/sugar mixture to the chocolate liquors or cocoa nibs from inferior cocoa beans has enhanced significantly the cocoa flavor thereof. For example, it has been found that adding these precursors to low to moderate flavor liquors increased the cocoa flavor score from expert panelists from about 5.3 to 6.0 and from 5.4 to 6.2. Therefore, adding the amino acid/sugar mixture to inferior chocolate liquors has increased the cacao flavor score from the low to moderate flavor range and from the moderate to high cacao flavor range.

The roasted fat matrix, especially the roasted chocolate liquor composition formed by the present invention, is useful for making chocolate confections and is used in place of the chocolate liquors normally utilized in making the various types of chocolates.

The most popular chocolate or chocolate candy consumed in the United States is in the form of sweet chocolate or milk chocolate. Milk chocolate is a confection which contains nonfat milk solids, milk fat, chocolate liquor, a nutritive carbohydrate sweetener, cocoa butter and may include other optional ingredients such as emulsifiers and flavorings and other additives. Sweet chocolate differs from milk chocolate in that it requires more chocolate liquor and limits the amount of milk solids. Semisweet chocolate requires at least 35% by weight chocolate liquor and is otherwise similar in definition to sweet chocolate. Commonly known dark chocolate, generally containing only chocolate liquor, a nutritive carbohydrate sweetener and cocoa butter, is by definition either a sweet chocolate or a semisweet chocolate. Buttermilk chocolate and skim milk chocolate differ from milk chocolate in that the milk fat comes from various forms of sweet cream buttermilk and skim milk, respectively, and in the case of skim milk, the total amount of milk fat is limited to less than the minimum for milk chocolate. Mixed dairy product chocolates differ from milk chocolate in that the milk solid includes any or all of the milk solids listed for milk chocolate, buttermilk chocolate or skim milk chocolate. White chocolate differs from milk chocolate in that it contains no non-fat cocoa solids. As used herein, the term "chocolate" denotes chocolate, baking chocolate, milk chocolate, sweet chocolate, semisweet chocolate, buttermilk chocolate, skim milk chocolate, mixed dairy product chocolate, white chocolate and nonstandardized chocolates, unless specifically identified otherwise.

Chocolate used in foods in the United States is subject to a standard of identity established by the U.S. Food and Drug Administration (FDA) under the Federal Food, Drug and Cosmetic Act. The U.S. definitions and standards for the various types of chocolate are well established and are found

in the Code of Federal Regulations, No. 21, Part 14, Cacao Products, Apr. 1, 1974, the contents of which are incorporated herein by reference. Nonstandardized chocolates are those chocolates which have compositions which fall outside the specified ranges of the standardized chocolates.

Examples of nonstandardized chocolates result when the cocoa butter or milk fat are replaced partially or completely; or when the nutritive carbohydrate sweetener is replaced partially or completely; or flavors imitating milk, butter or chocolate are added or other additions or deletions in formula are made outside the USFDA standards of identify of chocolate or combinations of any of the above.

As a confection, chocolate can take the form of solid pieces of chocolate, such as bars or novelty shapes, and can also be incorporated as a component of other, more complex confections where chocolate is combined with and generally coats other foods such as caramel, nougat, fruit pieces, nuts, wafers, or the like. These foods are characterized as microbiologically shelf-stable at 65°–85° F. under normal atmospheric conditions. Other complex confections result from surrounding soft inclusions such as cordial cherries or peanut butter with chocolate. Other complex confections result from coating ice cream or other frozen or refrigerated deserts with chocolate.

These chocolate products are prepared in accordance with conventional techniques, except the fat matrixes, such as chocolate liquor, containing the amino acid/sugar mixture of the present invention is substituted for the chocolate liquor normally utilized

The process of making chocolate is reviewed generally in B. L. Zoumas and E. J. Finnegan, "Chocolate and Cocoa", Kirk-Othmer Encyclopedia of Chemical Technology, Vol. 6 (3rd Ed., Wiley-Interscience, New York) 1–19 (1985) the contents of which are incorporated by reference. Processes for producing chocolate can be either "wet" or "dry". In the "wet" process, chocolate liquor is codried with sweetened condensed milk to generate a crumb that is microbiologically stable. In the "dry" process, milk powder is utilized rather than condensed milk. As such, the ingredients as received are microbiologically stable.

The "dry" process of making chocolate consists essentially of the steps of mixing, refining, conching or liquefying, standardizing and tempering to generate the desired rheology as needed for embodying, molding or producing novelty shapes.

In the first step in the preparation of milk chocolate, chocolate liquor is mixed with a nutritive carbohydrate sweetener, such as extra fine grade granulated sucrose, cocoa butter, and spray dried whole milk powder. The resulting mixture is a paste. Next, in the refining step, essentially a fine grinding operation, the coarse paste from the mixer is passed between steel rollers and converted to a refined flake. Refining breaks up crystalline sugar, fibrous cocoa matter and milk solids such that the sizes of the particles are significantly reduced. This particle size reduction results in the desired smoothness of the chocolate. This is usually accomplished by passing the mixture through a plurality of refining rolls.

In the conching step, the mixture is then stirred while heating to give the final desired consistency to the milk chocolate. This is a mixing-kneading process which allows moisture and volatile components to escape while smoothing the chocolate paste and is critical to the flavor and texture development of the chocolate. Flavor, emulsifiers or cocoa butter are often added during conching.

Alternatively to the conching step, the liquefying step mixes refined flake under high shear over a short period of time. The refined flake is quickly converted to a suspension of solids in a continuous fat phase. The lack of flavor development can be corrected by pretreating the liquor and cocoa butter.

Additional fat and emulsifier are then added in the standardizing or finishing step to adjust viscosity to final specifications.

The final step in obtaining the desired rheology of the chocolate is tempering, a process of inducing satisfactory crystal nucleation of the liquid fat in the chocolate. If the chocolate is improperly cooled, the resulting chocolate will have a grainy texture as well as poor color and appearance.

The tempered chocolate can then be molded or used in enrobing.

In the processes, described hereinabove, instead of using the conventional chocolate liquor, the fat matrix, such as chocolate liquor, containing the amino acid/sugar mixture of the present invention can be substituted therefor. The resulting chocolate product utilizing this roasted chocolate liquor produced in the present invention has acceptable sweet chocolate flavor and has a more enhanced and sweeter flavor than that of chocolate using non-treated chocolate liquor from inferior beans.

The above describes a process for preparing milk chocolate using the fat matrix, e.g., roasted chocolate liquor of the present invention. Other types of chocolate, such as sweet chocolate, buttermilk chocolate, and the like are also prepared utilizing the roasted fat matrix, e.g., roasted chocolate liquor of the present invention. It is mixed with the appropriate ingredients and then following the steps described hereinabove, i.e., refining, conching and liquefying, standardizing and tempering, in accordance with conventional techniques, the chocolate product is prepared.

Nonconventional chocolate confectionery products can also be prepared in accordance with the conventional process utilizing the roasted fat matrix, e.g., roasted chocolate liquor of the present invention, except sugar substitutes, such as bulking agents, sugar alcohols, high potency sweeteners may additionally be used in conjunction with the sucrose in the chocolate making process. Examples of such sugar substitutes include aspartame, cyclamate, saccharin, acesulfame, stevia sweetener, neohesperidin, dihydrochakone, sucralose, alitame, glycyrrhizin, thaumatol, sorbitol, mannitol, xylitol, maltitol, isomalt, lactitol, polydextrose, cellulose, maltodextrin, gum arabic, and the like.

Likewise, the amino acid/sugar mixtures in accordance with the present invention were also found to generate similar cacao flavor when roasted in cocoa butter and the cocoa butter equivalents CHOCLIN™ and COBERINE®.

Instead of cocoa butter, lower calorie fats such as CAPRENIN® may form all or part of the fat matrix and may be mixed with the amino acid/sugar mixture of the present invention to produce a cocoa-flavor enhanced chocolate. These products may be prepared by two different methods. Normally, to produce a CAPRENIN® low-calorie liquor, cocoa butter is removed from the initial liquor by roasting and pressing to obtain a powder which is then combined with CAPRENIN® to produce the low calorie liquor. This procedure was modified by adding the amino acid/sugar mix to the unroasted initial liquor prior to roasting and pressing to obtain a more favorable powder which was then combined with CAPRENIN® to produce a higher flavor low calorie liquor. The procedure was alternatively modified by first roasting the CAPRENIN® with the amino acid/sugar mix to produce a CAPRENIN® component having cocoa

flavor which was then added to the powder made from the liquor to produce a higher flavor low calorie liquor.

In addition to the above, it was also found that the addition of the amino acid/sugar mix improved the cacao flavor and overall acceptability of extracted liquor as well.

It was further found that chocolate products prepared utilizing the roasted fat matrix, e.g., chocolate liquor, of the present invention, were significantly higher in chocolate, bitter, nutty and dutch flavor and also in quality compared to the same chocolate products prepared without the treated liquor.

The sugar/amino acid mixture described hereinabove is not limited to sweetening and enhancing the cocoa flavor of chocolate liquors and cocoa beans. It can also be utilized to impregnate other bean products, such as coffee beans, vanilla beans, and the like. Utilizing the nib infusion roasting technique described hereinabove, the amino acid/sugar mixture is added to solvent, such as water, containing the bean product, such as coffee beans. The coffee beans are immersed in the aqueous solvent (e.g., soaked), dried and roasted, in accordance with the procedure described above for the nib infusing roasting technique. Alternatively, if a liquid is formed at any stage of the processing, such as in the manufacturing of instant coffee, the amino acid/sugar mixture is added to the liquid and it is then heated. The heat treatment with the bean intact or in the liquid stage is performed at a temperature and time sufficient to effectuate the reactions between the amino acids and sugar to produce cocoa flavored bean products, such as cocoa flavored coffee or vanilla beans, and the like. In these procedures it is preferred that the amino acid/sugar mixture is added to the solvent in the amounts described herein.

The following examples are provided to further illustrate the present invention.

EXAMPLE 1

Two mixtures of amino acids were formulated based on the free amino acid content of the hot water/cocoa bean extract and the free amino acid content of a fraction of this extract which was adsorbed on a fractionation resin and eluted with a 50% ethanol solution. The specific amino acid mixtures obtained were as follows:

Amino Acid	Resin Adsorbed Fraction	Whole Extract
aspartic acid	—	4.0 mg
glutamic acid	—	4.4 mg
serine	—	1.9 mg
histidine	—	1.9 mg
glycine	—	1.5 mg
threonine	—	1.9 mg
arginine	.37 mg	3.3 mg
alanine	.9 mg	4.4 mg
tyrosine	1.8 mg	3.4 mg
valine	5.9 mg	3.3 mg
phenylalanine	24.4 mg	5.6 mg
isoleucine	2.1 mg	2.0 mg
leucine	5.0 mg	7.0 mg
lysine	4.25 mg	3.0 mg

Each mixture was mixed with 1.5 g extracted liquor, 20 mg fructose, 5 mg arabinose, 5 mg glucose and 50 µl. water, and roasted for a period of 30 minutes at a temperature of 150° C. The amino acid mixture obtained from the resin fraction resulted in a greater cacao-like aroma than did the amino acid mixture obtained from the whole extract. In addition, the whole extract amino acid mixture resulted in the aroma having a strong burnt character as well.

EXAMPLE 2

An amino acid mixture was prepared, based on the free amino acid content of the material which adsorbs to the fractionation resin as determined in Example 1, as follows:

Amino Acid	Mg
arginine	1
alanine	1
tyrosine	2
valine	6
phenylalanine	25
isoleucine	2
leucine	5
lysine	5

The above amino acid mixture was mixed with either 20 mg of D-fructose, DL-arabinose or D-glucose, a mixture of sugars comprising 10 mg D-fructose, 5 mg D-glucose and 5 mg DL-arabinose, or no sugar at all, and then dispersed at a level of 5% in unroasted cocoa liquor by combining with 50 µl water and 2 g of hot water extracted liquor (i.e. the naturally occurring cacao flavor precursors had been removed), and roasted for 20 minutes at 150° C. in open vials. The amino acid/reducing sugars mixtures underwent Malliard reactions during the liquor roasting period and resulted in the generation of both cacao flavor and aroma.

Six different samples were run and the results are shown in Table I below. The cacao flavor which was generated was assessed by comparison with a sample derived from 300 mg whole extract powder roasted in 1.7 g extracted liquor. The samples were given randomly and unidentified to expert panelists. Panelists were asked to rate each sample's flavor level for cacao, sugar, hammy/smokey, putrid and floral notes. They were also allowed to add any additional notes they wish. Each person's added notes were revealed at the end of each panel to allow others to add them if they wished. Duplicate judgments were obtained, and the data were analyzed via multifactor Analysis of Variance. Flavor scores were rated on a scale of 0–100 and the results are based on an average of five panelists.

TABLE I

Sugar effect on amino acid mixture and production of cacao flavor.

Flavor Whole Sample	Cacao Sugar	Mixture	Amino Acid Extract	Rating
A	—	–	300 mg	82
B	DL-arabinose	+	—	31
C	—	+	—	14
D	glucose	+	—	24
E	Mix	–	—	4
F	—	–	300 mg	71
G	Mix	+	—	35
H	D-fructose	+	—	37

As shown by the results in Table I, a more intense cacao-like flavor was developed when the amino acid mixture was roasted in the presence of one or all of the sugars (see samples B,D,G and H) as opposed to the amino acid mixture which was roasted without the addition of a reducing sugar (see sample C). Further, it appeared that the type of reducing sugar added did not have a large effect on the cacao-like flavor development. However, of the sugars, fructose alone (sample H) or the mixture of sugars (sample

G) had better results than the samples which employed arabinose or glucose alone (samples B and D) when mixed with the mixture of eight amino acids.

EXAMPLE 3

An eleven component amino acid/reducing sugar mixture in accordance with the present invention was prepared by grinding together the sugars and amino acids using a mortar and pestle, and this was subsequently thoroughly mixed in extracted liquor. Said samples were identified as Samples I and II respectively. It is to be noted that Sample II is the amino acid/sugar mixture disclosed by K. H. Ney in Gordian 85(5):88–92 (1985), with the modification that the amino acid/sugar mixture is placed in a chocolate liquor extract. Samples of both mixtures and a freeze dried extract control were roasted in extracted liquor for a period of 25 minutes at 150° C. in recti-vials. The samples were evaluated for taste by a four person sensory panel in accordance with the procedure described in Example 2 and the results are given in Table II below.

TABLE II

Cocoa Flavor of Various Amino Acid/Sugar Mixtures

Amino Acids		Sugars		Matrix	Cacao Flavoring Rating (0–100)
Sample I					
arginine	(3 mg)	fructose	(50 mg)	9.75 g	25
alanine	(3 mg)	glucose	(17 mg)		
tyrosine	(6 mg)	arabinose	(17 mg)		
valine	(20 mg)				
phenylalanine	(82 mg)				
isoleucine	(6 mg)				
leucine	(17 mg)				
lysine	(17 mg)				
Sample II					
phenylalanine	(50 mg)	fructose	(100 mg)	9.75 g	15
leucine	(50 mg)				
valine	(50 mg)				
Freeze Dried extract of Sample I					
	(450 mg)			4.5 g	35

As is shown by the comparison of the results given in Table II, the first sample contained the most cocoa flavor, and was significantly preferred over the second sample, i.e., the sample containing the mixture of Ney.

EXAMPLE 4

Based on an optimization study on the eleven component amino acid/sugar mixture of Example 3, a simpler amino acid/sugar mixture in accordance with the present invention was determined and comprised phenylalanine, leucine, alanine, tyrosine and glucose. In order to determine the optimal amounts of those four amino acids to be used, an experiment was designed where the glucose content was kept constant (except for one sample which had twice the glucose content as the others and one sample which had half the glucose content as the others) and the four amino acids were added at five different levels to two hundred grams of extracted liquor. Thirty liquor samples were produced, roasted, and each was tested twice by seven panelists and evaluated for cacao flavor, total flavor and off flavors in accordance with the procedure described in Example 2. The results are shown in Table III below.

TABLE III

Variations in four amino acid/one sugar mixture of present invention.

SAMPLE	TOTAL FLAVOR	CACAO FLAVOR	OFF FLAVOR	PHE (mg/ 200 g extracted liquor)	LEU (mg/ 200 g extracted liquor)	TYR (mg/ 200 g extracted liquor)	ALA (mg/ 200 g extracted liquor)	GLUCOSE (mg/ 200 g extracted liquor)
1	56.4	30.4	24.3	2500	1000	1000	500	3000
2	54.3	29.6	19.3	3750	500	1500	750	3000
3	44.3	26.1	6.8	3750	1500	1500	250	3000
4	31.8	8.2	13.9	2500	0	1000	500	3000
5	53.6	34.0	16.1	3750	1500	500	250	3000
6	53.9	26.4	19.7	3750	500	1500	250	3000
7	35.0	15.4	15.4	0	1000	1000	500	3000
8	54.0	36.1	11.4	1250	1500	500	250	3000
9	34.3	13.6	10.7	1250	1500	1500	750	3000
10	41.4	18.6	15.0	1250	500	1500	750	3000

TABLE III-continued

Variations in four amino acid/one sugar mixture of present invention.

SAMPLE	TOTAL FLAVOR	CACAO FLAVOR	OFF FLAVOR	PHE (mg/ 200 g extracted liquor)	LEU (mg/ 200 g extracted liquor)	TYR (mg/ 200 g extracted liquor)	ALA (mg/ 200 g extracted liquor)	GLUCOSE (mg/ 200 g extracted liquor)
11	58.9	33.2	14.7	1250	1500	500	750	3000
12	60.0	33.6	21.4	2500	1000	2000	500	3000
13	47.9	25.4	16.5	3750	1500	500	750	3000
14	42.2	21.8	10.8	2500	1000	1000	500	3000
15	56.1	31.1	21.4	2500	1000	0	500	3000
16	60.0	31.4	25.0	5000	1000	1000	500	3000
17	44.2	22.9	11.1	2500	1000	1000	1000	3000
16	41.8	19.3	13.5	1250	1500	1500	250	3000
19	39.3	17.9	9.7	1250	500	500	250	3000
20	40.0	11.8	17.5	1250	500	500	750	3000
21	58.6	35.3	16.5	3750	1500	8250	750	3000
22	51.8	34.0	13.9	1250	500	1500	250	3000
23	45.4	21.1	12.9	3750	500	500	250	3000
24	54.6	27.8	15.7	3750	500	500	750	3000
25	49.3	24.3	15.7	2500	2000	1000	500	3000
26	49.2	29.6	11.4	2500	1000	1000	0	3000
27	60.4	30.7	19.3	2500	1000	1000	500	3000
28	21.08	0.9	13.0	0	0	0	0	3000
29	44.7	22.9	10.4	2500	1000	1000	500	1500
30	40.4	18.9	13.9	2500	1000	1000	500	6000

As can be seen by the results given in Table III, all of the samples provided flavor. However, a more intense cacao flavor was positively correlated with higher levels of leucine and phenylalanine and negatively correlated with higher levels of tyrosine. Consequently, the best cacao flavor was obtained when phenylalanine was at its highest level, leucine was at its highest level and tyrosine was at its lowest level (see, for example, samples 5 and 13 of Table III). A significant interaction was also detected between alanine and phenylalanine in that the better cacao flavor was obtained when both of these amino acids were at high levels. Good flavor was also found to be generated when phenylalanine was high and alanine was low or when both phenylalanine and alanine were low. However, where alanine was present at high levels and phenylalanine was present at low levels, said combination produced less flavor (see sample nos. 9–11 and 20 of Table III).

Based on the analysis of the results shown in Table III together with the results shown in Table II, it was determined that phenylalanine, leucine and especially phenylalanine, leucine and alanine were major contributors to the cacao flavor produced when the amino acid/sugar mix was roasted in extracted liquor. Optimum effects were found where said mix comprised 2000 mg leucine/200 g liquor, 3750 mg phenylalanine/200 g liquor, 750 mg alanine/200 g liquor and 3000 mg glucose/200 g liquor. Tyrosine was not included in this optimum mix.

EXAMPLE 5

Three amino acid/sugar mixtures were prepared with the following compositions:

Ingredient	Mixture 1*	Mixture 2*	Mixture 3*
leucine	1000	370	1000
phenylalanine	1875	1800	1875
alanine	375	70	375
arginine		70	70
isoleucine		70	70
lysine		370	370
tyrosine		130	0
valine		430	430
arabinose		412	412
fructose		825	825
glucose	1500	412	412

*(all amounts given in mg/100 g liquor)

Mixture 1 represented the optimum mixture, Mixture 2 represented an eleven component mix and Mixture 3 represented the original eleven component mix but with the optimum levels of the leucine, phenylalanine and alanine as used in Mixture 1. In addition, it is noted that tyrosine was omitted from Mixture 3.

The amino acid/sugar mixtures were refined into extracted liquor and the liquor was roasted for a period of 6.5 minutes at a temperature of 165° C. The liquors were tasted twice by a panel of seven and rated for total flavor, cacao flavor and off-flavors in accordance with the procedure described in Example 2. The results are given in Table IV.

TABLE IV

Comparison of optimum mixed original eleven component mix.

Mixture	Total Flavor	Cacao Flavor	Off Flavor
1	54.3	27.9	20.7
2	55	33.2	16.9
3	58.6	35.0	21.1

As shown by the results given in Table IV, Mixture 3 had the highest cacao scores although the differences from the other mixtures were not significant. Consequently, it was

found that leucine, phenylalanine and alanine and especially phenylalanine and leucine, were the major contributors to cacao flavor, and that while the other components may have added some additional good flavors, their contribution was relatively minor in comparison.

EXAMPLE 6

Once it was determined that the eleven component mix of Example 3 was successful in generating cacao flavor when roasted in extracted liquor, the capabilities of the amino acid/sugar mixture was then tested in other mixtures and compared to the results obtained with the extracted liquor.

The amino acid/sugar mix prepared in accordance with Example 5 was roasted in the following matrices and produced the indicated flavors:

Roasting Matrix	Flavor
A) CHOCLIN ™ (6 g) + cellulose (4 g)	bitter, metallic carbo, chemical, cacao
B) COBERINE ® (6 g) + cellulose (4 g)	bitter, metallic, cacao
C) CRISCO ® (6 g) + cellulose (4 g)	bitter, grain, starch
D) cocoa butter (6 g) + cellulose (4 g)	bitter, cacao
E) extracted liquor (10 g)	floral, bitter, cacao, bread

Of the five matrices, cacao flavor was best generated in the extracted liquor. However, cacao flavor was also significantly generated in the cocoa butter, COBERINE® and CHOCLIN™ matrices with the cocoa butter matrix providing a somewhat greater cocoa flavor than the COBERINE® and CHOCLIN™ matrices, and the COBERINE® matrix generating a somewhat greater cacao flavor than the CHOCLIN™ matrix. Essentially no cacao flavor was generated when the amino acid/sugar mixture was roasted in the CRISCO® shortening, which is a cooking shortening, and not a shortening used in making chocolate confections.

EXAMPLE 7

The amino acid/sugar mixture as set forth in Example 5, Mixture 2, was added to unroasted liquor. The liquor was then refined using the roller refiner. The unroasted liquor, both with and without the addition of amino acid/sugars mixture underwent heating blocked roasting in reacti-vials (3 g/vial) for a period of twenty minutes at a temperature of 150° C. After roasting, the cocoa butter was pressed from the liquor using the carver press. The pressed powder was then mixed with CAPRENIN® at a ratio of 4 g powder/10 g CAPRENIN®. A third sample of pressed powder (plant roasted) was also mixed with CAPRENIN®. The three samples were tasted and rated on a scale of 0 to 100 in terms of cacao flavor, off flavors and over all acceptabilities in accordance with the procedure described in Example 2. The results, averaged from four panelists, are shown in Table V below:

TABLE V

Sample	Cacao Flavor	Off Flavor	Overall Acceptability
pressed powder without amino acid/sugar mixture	38.75	4.5	42.0
pressed powder with amino acid/sugar mixture	50.25	5.0	51.5
plant roasted pressed powder	44.25	3.0	51.75

From the results of the panelist testing, it was found that the addition of the amino acid/sugars mixture to the liquor prior to roasting and pressing increased the production of cacao flavor in the final powder/CAPRENIN® blend. It was further determined that plant roasting generated greater flavor than roasting the liquor under heating block conditions.

EXAMPLE 8

The amino acid/sugar mixture as set forth in Example 5, Mixture 2 was added to CAPRENIN® and 2% powdered cellulose in a ratio of 1:20. The CAPRENIN®/cellulose/amino acid/sugar mixture was roasted in reacti-vials (3 g/vial) for either 10, 15 or 22 minutes at 150° C. After roasting, the mixture was mixed with pressed powder (plant roasted) obtained from chocolate liquor. These samples along with a sample of unroasted CAPRENIN® and cellulose and powder were rated for cocoa flavor, off flavors and overall acceptability on a scale of 0 to 100, in accordance with the procedure described in Example 2.

Sample	Cacao Flavor	Off Flavor	Overall Acceptability
pressed powder & CAPRENIN ® without amino acid/ sugar mixture	16.5	1.0	21.5
pressed powder & CAPRENIN ® with amino acid/sugar mixture - 10 min. roast	46.0	23.0	46.0
pressed powder & CAPRENIN ® with amino acid/sugar mixture - 15 min. roast	43.5	23.5	48.5
pressed powder & CAPRENIN ® with amino acid/sugar mixture - 22 min. roast	38.5	32.0	27.5

From the results of the panelist testing, it was found that cacao flavor and overall acceptability of the low calorie liquor is increased by roasting the amino acid/sugar mix in CAPRENIN® and using this flavorful CAPRENIN® to formulate the liquor as opposed to using unadulterated CAPRENIN® in the mix. It was further determined that flavor in the roasted amino acid/sugar/CAPRENIN® mix is sensitive to roasting conditions; over roasting leads to the generation of off flavors and lower acceptability.

EXAMPLE 9

In order to determine the flavor effect of the addition of the amino acid/sugar mix in accordance with the present invention to non-extracted liquor, an amino acid/sugar mix

comprising 1500 mg phenylalanine, 375 mg leucine, 750 mg tyrosine, 250 mg alanine and 750 mg glucose was refined into two different raw liquors. These liquors were previously shown to have low cacao flavor potential. These liquors and the amino acid/sugar mixture, along with control samples of the liquors without additions, were flake roasted for a period of about 5.75 to about 6 minutes. The samples were roasted and rated for cacao flavor, off flavor and overall acceptability in accordance with the procedure described in Example 2 and the results are given in Table VI.

TABLE VI

	Amino acid/sugar mixture with non-extracted liquors.		
	Cacao Flavor	Off Flavors	Overall Acceptability
Liquor A	18	16	26
Liquor A & amino acid/ sugar mixture	28	26	36
Liquor B	18	34	16
Liquor B & amino acid/ sugar mixture	32	10	50

As can be already seen from the results of the tests, the addition of the amino acid/sugar mix of the present invention markedly improves the cacao flavor and overall acceptability of non-extracted liquors.

EXAMPLE 10

The following samples were obtained:

1. Liquor B Control: Liquor B cocoa nibs roasted as liquor for 20 minutes at 120° C.
2. Liquor B Variant: 5 g leucine, 9.37 g of phenylalanine 1.87 g alanine and 7.5 g glucose were added to 500 g of unroasted Liquor B and roasted in a liquor roaster for 20 minutes at 120° C.
3. Liquor A Control: Liquor A cocoa nibs were roasted as liquor in a liquor roaster for 20 minutes at 120° C.
4. Liquor A Variant: 5 g leucine, 9.37 g phenylalanine, 1.8 g alanine and 7.5 g glucose were added to 500 g of unroasted Liquor A and roasted for 20 minutes at 120° C.

Each of the samples were submitted to the taste panelist in accordance with the procedure described in Example 2.

The panel concluded that there were no statistically reliable differences in cacao flavor between Liquor A and Liquor B without precursors added. However, samples with the precursors added were significantly higher in cacao flavor than those without.

EXAMPLE 11

The Liquor A liquor roasted both with and without the amino acid/sugar mix of Example 10 was used to make dark chocolate and mixed as follows:

	AMOUNT BY WEIGHT	AMOUNT BY WEIGHT
Liquor A liquor	38%	—
Sugar(Sucrose)	50%	50%
added cocoa butter	12%	12%
Lecithin	0.02%	0.02%
Liquor A liquor + amino acid/sugar mixture	—	38%

-continued

Each sample was conched, and refined into dark chocolate, and molded into dark chocolate bars. The bars were submitted to a trained sensory panel for evaluation, in accordance with the procedure of Example 2.

The panel concluded that dark chocolate made with precursor treated liquor (amino acid/sugar mixture) was significantly higher in chocolate, bitter, nutty and dutch flavors and also in quality compared to chocolate made with untreated liquor.

EXAMPLE 12

The Liquor A liquor roasted both with and without the amino acid/sugar mixture of Example 10 was used to make milk chocolate as follows:

	PERCENT BY WEIGHT	PERCENT BY WEIGHT
Liquor A liquor	13%	—
Milk solids	18%	18%
Sugar	48%	48%
Lecithin	0.02%	0.02%
added cocoa butter	21%	21%
Liquor A liquor + amino acid/sugar mix	—	13%

Each sample was conched and refined into milk chocolate and molded into milk chocolate bars. The bars were submitted to a trained sensory panel for evaluation, in accordance with the procedure of Example 2.

The panel concluded that the milk chocolate made with precursor treated liquor (amino acid/sugar mixture) was significantly higher in chocolate and perfumey flavors.

EXAMPLE 13

Three different samples were prepared

(a) control-untreated low flavor (Liquor A) cocoa nibs (500 g) added to water.

(b) Variant 1–1.5 g leucine, 9.3 g of phenylalanine, 1.87 g of alanine and 7.5 g glucose were dissolved in water. 500 g of cocoa nibs were added to the solution.

(c) Variant 2–500 g of low flavor (Liquor A) cocoa nibs and 45% of the amino acid/sugar mixture added to variant 1, i.e., 2.3 g of leucine, 4.2 g of phenylalanine, 0.8 g of alanine and 3.4 g of glucose dissolved in water.

In each sample, the nibs were allowed to soak in the water at 50° C. for one hours. The water content of the nib, at the end of the soaking step is about 30% (w/w). The nibs were separated from the solution and dried in an oven at 50° C. to lower the moisture content to 5%. The nibs were roasted for two minutes at 165° C.

The nibs were then ground and refined to form liquor.

Each of the samples of the nib roasted liquors were evaluated for taste randomly and unidentified. Panelists were asked to rate each sample's flavor level for cacao flavor, sour flavor, putrid flavor, bitter flavor, nutty flavor, cheesy flavor and overall quality.

The control had greater cheesy flavor, nutty flavor, sour flavor and putrid flavor than either variant 1 or variant 2. The

cacao flavor and overall quality of variant 1 and variant 2 were about the same and were directionally better than that of the control.

The above preferred embodiments and examples are given to illustrate the scope and spirit of the present invention. The embodiments and examples described herein will make apparent, to those skilled in the art, other embodiments and examples. These other embodiments and examples are within the contemplation of the present invention. Therefore, the present invention should be limited only by the appended claims.

What is claimed is:

1. A process for enhancing cocoa flavor in a fat matrix comprising:

(a) mixing a reducing sugar with a first and second amino acid in a fat matrix, said first amino acid being phenylalanine and said second amino acid being leucine, with each amino acid and each reducing sugar being present in the following amounts per 100 g of said fat matrix:
(i) about 0.3 g to about 4.0 g phenylalanine;
(ii) about 0.3 g to about 2.0 g leucine;
(iii) about 0.5 g to about 3.0 g reducing sugar, the weight of phenylalanine being present is at least 1.25 times the weight of leucine present, and

(b) roasting the mixture under conditions sufficient to effect flavor producing reactions between the amino acids and the reducing sugar.

2. The process according to claim **1** wherein the ratio of the total weight of amino acids to the total weight of the reducing sugar ranges from about 0.2:1 to about 3:1.

3. The process of claim **1** where the ratio of phenylalanine to leucine ranges from about 1.5 to about 6.0 (w/w).

4. The process of claim **1** where the amino acids are in the L-configuration.

5. The process of claim **1** wherein the reducing sugar is in the D configuration or is a racemic mixture.

6. The process of claim **1** wherein the reducing sugar is glucose, fructose, arabinose or mixtures thereof.

7. The process according to claim **1** wherein the fat matrix is chocolate liquor.

8. The process of claim **1** in which the fat matrix is cocoa butter, a cocoa butter equivalent, a cocoa butter substitute or a combination thereof.

9. The process of claim **8** wherein the fat matrix is cocoa butter, caprocaprylobehenin, vegetable oil from palm and shea, or a product produced by the interesterification of highly hydrogenated vegetable oil with a triacylglycerol of acetic acid, propionic acid, butyric acid or a combination thereof.

10. The process according to claim **1** wherein the fat matrix is cocoa butter admixed with a second fat which is a cocoa butter equivalent or cocoa butter substitute.

11. The process according to claim **10** wherein the second fat is caprocaprylobehenin, vegetable oil from palm and shea, or a product produced by the interesterification of highly hydrogenated vegetable oil with a triacylglycerol of acetic acid, propionic acid, butyric acid or a combination thereof.

12. The process according to claim **1** wherein a third amino acid is added to the unroasted fat matrix, wherein the third amino acid is alanine.

13. The process according to claim **10** wherein alanine is present in amounts ranging from about 0.05 g to about 0.8 g for each 100 g of unroasted fat matrix.

14. The process according to claim **1** wherein alanine is added and wherein at least one additional amino acid is selected from the group consisting of tyrosine, arginine, valine, isoleucine and lysine are added to the unroasted fat matrix.

15. The process according to claim **14** wherein for each 100 g of fat matrix is added about 0.05 g to about 0.8 g alanine, up to about 1.5 g of tyrosine, up to about 0.4 g arginine, up to about 0.7 g of valine, up to about 0.3 g isoleucine, and up to about 0.75 g lysine.

16. A process for enhancing cocoa flavor in a fat matrix comprising:

(a) mixing a reducing sugar with first, second and third amino acids in a fat matrix, said first amino acid being phenylalanine, said second amino acid being leucine and said third amino acid being alanine, with each amino acid and each reducing sugar being present in the following amounts per 100 g of said fat matrix;
(i) about 0.3 g to about 4.0 g phenylalanine;
(ii) about 0.3 g to about 2.0 g leucine;
(iii) about 0.05 to about 0.8 g alanine and
(iv) about 0.5 g to about 3.0 g reducing sugar and

(b) roasting the mixture under conditions sufficient to effect flavor producing reactions between the amino acids and the reducing sugars.

17. The process of claim **16** wherein the ratio of the total weight of amino acids to the total weight of reducing sugar ranges from about 0.2:1 to about 3:1.

18. The process of claim **16** wherein the amino acids are in the L-configuration.

19. The process of claim **16** wherein the reducing sugars in the D configuration or in a racemic mixture.

20. The process of claim **16** wherein the reducing sugar is glucose, fructose, arabinose or mixtures thereof.

21. The process according to claim **16** wherein the fat matrix is chocolate liquor or nibs from cocoa beans.

22. The process according to claim **16** wherein the fat matrix is cocoa butter, cocoa butter equivalent, a cocoa butter substitute or a combination thereof.

23. The process of claim **22** wherein the fat matrix is cocoa butter, caprocaprylobehenin, vegetable oil from palm and shea, or a product produced by the interesterification of highly hydrogenated vegetable oil with a triacylglycerol of acetic acid, propionic acid, butyric acid or a combination thereof.

24. The process according to claim **16** wherein the fat matrix is cocoa butter admixed with a second fat comprising a cocoa butter equivalent or cocoa butter substitute.

25. The process according to claim **24** wherein the second fat is caprocaprylobehenin, vegetable oil from palm and shea, or a product produced by the interesterification of highly hydrogenated vegetable oil with a triacylglycerol of acetic acid, propionic acid, butyric acid or a combination thereof.

26. The process according to claim **16** wherein additional amino acids are added in step (a).

27. The process according to claim **26** wherein at least one of the amino acids selected from the group consisting of tyrosine, arginine, valine, isoleucine and lysine is added to the unroasted fat matrix.

28. A process for enhancing cocoa flavor in chocolate liquor derived from inferior cocoa beans comprising (a) mixing amino acids with a reducing sugar in chocolate liquor, said amino acids comprising phenylalanine, leucine and alanine, with each amino acid and each reducing sugar being present in the following amounts per each 100 g of chocolate liquor: about 0.3 g to about 4.0 g phenylalanine, about 0.3 g to about 2.0 g leucine, and 0.05 g to about 0.8 g of alanine and about 0.5 g to about 3.0 g reducing sugar and (b) roasting the mixture of (a) under sufficient conditions to effect flavor producing reactions between the amino acids and the reducing sugar.

29. The process of claim 28 wherein the ratio of the total weight of amino acids to the total weight of the reducing sugar ranges from about 0.2:1 to about 3:1.

30. The process of claim 28 wherein the ratio of phenylalanine to leucine ranges from about 1.5 to about 6 (w/w).

31. The process of claim 28 wherein the amino acids are in the L-configuration.

32. The process of claim 28 wherein the reducing sugar is in the D-configuration or is a racemic mixture.

33. The process according to claim 28 wherein the reducing sugar is glucose, fructose or arabinose or mixtures thereof.

34. The process according to claim 28 wherein the amount of phenylalanine present ranges from about 1.0 g to about 2.0 g per 100 g of unroasted chocolate liquor.

35. The process according to claim 28 wherein the alanine is present in amounts ranging from about 0.1 g to about 0.5 g per 100 g of unroasted chocolate liquor.

36. The process according to claim 28 wherein the amount of leucine present ranges from about 0.5 to about 1.25 g per 100 gms of unroasted chocolate liquor.

37. The process according to claim 28 wherein the amount of reducing sugar present ranges from about 0.75 to about 1.5 g per 100 g of unroasted chocolate liquor.

38. The process according to claim 28 wherein at least one additional amino acid selected from the group consisting of tyrosine, arginine, valine, isoleucine and lysine is additionally added to the unroasted chocolate liquor.

39. The process according to claim 38 wherein up to about 1.5 g tyrosine, up to about 0.4 g arginine, up to about 0.7 g valine, up to about 0.3 g isoleucine, or up to about 0.75 g lysine is additionally added for each 100 g of unroasted chocolate liquor.

40. A process for enhancing the cocoa flavor of cocoa nibs from inferior cocoa beans comprising:

(a) soaking said cocoa nibs with an amino acid/sugar mixture in water under conditions effective for the amino acid/sugar mixture to be absorbed by the cocoa nibs, said amino acid/sugar mixture comprising an amino acid component and a reducing sugar, said amino acid component being a mixture of phenylalanine and leucine with said amino acid component and said reducing sugar being present in amounts relative to that quantity of cocoa nibs that would generate, when ground and refined, 100 g of unroasted liquor, as follows: about 0.3 g to about 4.0 g phenylalanine, about 0.3 g to about 2.0 g leucine, and 0.5 g to about 3.0 g of reducing sugar, the weight of phenylalanine present is at least 1.25 times the weight of leucine present; and

(b) roasting the cocoa nibs under conditions effective to promote flavor-producing reactions.

41. The process according to claim 40 wherein alanine is additionally present.

42. A process for enhancing the cocoa flavor of cocoa nibs from inferior cocoa beans comprising:

(a) soaking said cocoa nibs with an amino acid/sugar mixture in aqueous solvent under conditions effective for the amino acid/sugar mixture to be absorbed by the cocoa nibs, said amino acid/sugar mixture comprising an amino acid component and a reducing sugar, said amino acid component being a mixture of phenylalanine, leucine and alanine and said amino acids component and said reducing sugar being present in amounts relative to that quantity of cocoa nibs that would generate, when ground and refined, 100 g of unroasted liquor, as follows:

about 0.3 g to about 4.0 g phenylalanine, about 0.3 g to about 2.0 g leucine, 0.5 g to about 3.0 g of reducing sugar and about 0.05 g to about 0.8 g alanine; and

(b) roasting the cocoa nibs under conditions effective to promote flavor-producing reactions.

43. The process according to claim 40 or 42 wherein the cocoa nibs are separated from the excess solvent prior to roasting.

44. The process according to claim 40 or 42 wherein the cocoa nibs are separated from the excess and dried under conditions to effectively reduce the moisture content thereof.

45. The process of claim 40 or 42 which additionally comprises grinding and refining the roasted cocoa nibs.

46. The process of claim 40 or 42 wherein the ratio of the total weight of amino acids to the total weight of the reducing sugar ranges from about 0.2:1 to about 3:1.

47. The process of claim 40 or 42 wherein the ratio of phenylalanine to leucine ranges from about 1.5 to about 6 (w/w).

48. The process of claim 40 or 42 wherein the amino acids are in the L configuration.

49. The process according to claim 40 or 42 wherein the reducing sugar is glucose, fructose or arabinose.

50. The process according to claim 40 or 42 wherein the phenylalanine is present in amounts ranging from about 1.0 g to about 2.0 g.

51. The process according to claim 40 or 42 wherein the amount of leucine ranges from about 0.5 to about 1.25 g.

52. The process according to claim 40 or 42 wherein the amount of reducing sugar present ranges from about 0.75 g to about 1.5 g.

53. The process according to claim 40 or 42 wherein at least one additional amino acid selected from the group consisting of tyrosine, arginine, valine, isoleucine, and lysine is additionally added to the amino acid/sugar mixture.

54. The process according to claim 42 wherein the amount of alanine present ranges from about 0.1 g to about 0.5 g.

55. The process according to claim 40 or 42 wherein the reducing sugar is in the D configuration or in racemic mixtures.

56. The process according to claim 40 or 42 wherein the reducing sugar is D glucose, D fructose, D arabinose, D, L-arabinose or a combination thereof.

* * * * *

EXHIBIT I

United States Patent [19]

Eggen

[11] **4,343,818**

[45] **Aug. 10, 1982**

[54] **COCOA PRODUCT AND PROCESS OF PREPARATION**

[75] Inventor: **Ingmar B. Eggen**, New Milford, Conn.

[73] Assignee: **Societe d'Assistance Technique pour Produits Nestle S.A.**, Lausanne, Switzerland

[21] Appl. No.: **142,123**

[22] Filed: **Apr. 21, 1980**

Related U.S. Application Data

[63] Continuation of Ser. No. 933,967, Aug. 15, 1978, abandoned.

[51] **Int. Cl.**[3] **A23G 1/02**

[52] **U.S. Cl.** **426/45**; 426/52; 426/459; 426/469; 426/489; 426/507; 426/593; 426/631; 426/650; 426/655

[58] **Field of Search** 426/45, 52, 270, 331, 426/593, 631, 650, 655, 459, 464, 472, 489, 495, 469, 478, 482, 507

[56] **References Cited**

U.S. PATENT DOCUMENTS

571,238	11/1896	Pieper	426/45
1,854,355	4/1932	Wallerstein	426/45
2,014,342	9/1935	Gutekunst	426/45
2,380,158	7/1945	Durrenmatt et al.	426/631 X
2,899,309	8/1959	Rusoff	426/631
2,965,490	12/1960	Rusoff	426/45
3,392,027	7/1968	Hess	426/45
3,397,061	8/1968	Katz	426/45
3,821,420	6/1974	Arden	426/593 X
3,982,042	9/1976	Arden	426/631
3,997,680	12/1976	Chalin	426/631 X

FOREIGN PATENT DOCUMENTS

49-33137	4/1974	Japan	426/45

OTHER PUBLICATIONS

Hawley, *The Condensed Chemical Dictionary*, 9th Ed., 1977, p. 268.

Primary Examiner—Arthur L. Corbin
Attorney, Agent, or Firm—Vogt & O'Donnell

[57] **ABSTRACT**

A cocoa product is prepared by enzymatically hydrolyzing an aqueous slurry of low fat cocoa with an amylase-containing enzyme, adding alkali to the hydrolyzed slurry and heating the alkali containing slurry.

12 Claims, No Drawings

COCOA PRODUCT AND PROCESS OF PREPARATION

This is a continuation of application Ser. No. 933,967, filed Aug. 15, 1978, now abandoned.

This invention relates to edible products obtained from cocoa especially suitable for use as colouring and flavouring agents.

Conventional cocoa powder is prepared from roasted cocoa beans by removing the husks or shells and grinding the roasted beans to a semi-liquid sludge known as cocoa liquor. The fat (cocoa butter) is then separated from the cocoa liquor, generally by pressing, and the partially defatted cocoa solids are finely ground to give the product known as cocoa, or cocoa powder. The cocoa powder may then be subjected for a further treatment known as "dutching", in which it is contacted with an alkali, usually potassium carbonate, in the presence of water.

The main purpose of dutching is to render the cocoa more easily dispersible in water. The chemical reactions which occur during dutching are complex but it is believed that a limited hydrolysis takes place, producing compounds which render the cocoa less hydrophobic.

The traditional dutching process gives a product which disperses in warm water or milk more or less readily but which is still far from being completely soluble. Thus, on dispersion in water, an emulsion is produced rather than a solution and the emulsion is opaque with a deep brown colour and characteristic heavy taste. These characteristics make conventional cocoa unsuitable for colouring and flavouring foods requiring a light appearance and texture, such as certain types of decorative creams and icings, or for soft drinks in which complete water-solubility is practically essential.

It is therefore an object of the invention to provide a cocoa product which possesses a desirable dark colour.

Other objects of the invention will become apparent from the following description.

According to the invention, a process for making a cocoa product comprises mixing low fat cocoa with water to form a cocoa slurry, enzymatically hydrolysing the slurry and subsequently heating the slurry with an alkali.

The term "low fat cocoa" is well known in the chocolate industry, meaning a cocoa containing less than about 12% of fat, and it is used herein in this sense.

The low fat cocoa used as starting material for the process according to the invention is produced in accordance with traditional methods. Raw cocoa beans are first roasted, the roasted beans are cooled and the shells are removed. The deshelled beans, known as nibs, are then ground and during grinding the temperature of the nibs rises sufficiently to melt the fat giving a brown viscous sludge known as cocoa liquor.

Following conventional practice, the cocoa liquor is then pressed or otherwise processed to remove much of the cocoa fat (cocoa butter), whereby the fat content is reduced from about 50% to less than about 12% for a low fat cocoa, and a "cake" of low fat cocoa is produced. The cake is then ground to a relatively fine powder, e.g. 120 mesh.

According to the present invention, this powder is first mixed with water, e.g. from 2 to 3 parts by weight water for 1 part low fat cocoa and heated, e.g. to 75° to 90° C. to give a hydrated cocoa slurry.

An amylase-containing enzyme preparation is then added to the hydrated to bring about hydrolysis of the carbohydrate constituents in the cocoa. The optimum conditions for hydrolysis depend on the enzyme used. For a typical enzyme (Rhozyme H-39 at a concentration of 16×10^{-4} parts by weight per 1 part cocoa) a temperature of 77° C. for a time of 15 minutes is sufficient. The slurry becomes substantially completely liquid as the high molecular weight carbohydrate constituents are degraded to compounds of lower molecular weight.

After hydrolysis and addition of other constituents, such as sucrose, if required, the liquefied slurry is "dutched", e.g. treated with an alkali such as sodium hydroxide. This is best carried out in a stirred vessel with a copious supply of air. During stirring the slurry with added alkali is heated, e.g. to 88° to 93° C. and water must generally be added to replace that lost by evaporation. The alkali may be added in a single charge initially or if more vigorous dutching is required it may be added in successive charges as the alkali is consumed. The slurry is advantageously dutched in a jacketed vessel which is heated by steam injection.

As the cocoa has been liquefied by hydrolysis, more efficient mixing with the alkali, the sugar if added, is obtained than with unhydrolysed cocoa. Contact with the air is also greatly improved by the hydrolysis and this gives improved colour development.

During prolonged dutching the colour of the cocoa changes gradually, first to a deep red and eventually to black. The "chocolatey" flavour is progressively reduced in intensity during the process and a product is finally obtained which is readily water-soluble with little insoluble residue.

After dutching the resulting liquid may be used directly as a flavouring or colouring, for example in ice cream or in fondants. However, if it is centrifuged to remove residual solids a clear syrup is produced which is readily dispersed in water and is especially useful for making cocoa-flavoured milk or soft drinks. When it is mixed with carbonated water, for example, a very tasteful beverage is produced having a clear, sparkling appearance. Further flavouring and colouring agents, preservatives, dietetic supplements and other additives may also be added.

If the product is to be stored before use, it is usually advantageous to dry the syrup to a solid powder. This may be done by any established drying technique, such as double drum drying or spray-drying. The dried solid is ground and sifted to the required grain size e.g. 170 mesh. On stirring in an aqueous medium the powder readily dissolves. Alternatively, the powder may be dissolved in an organic carrier, e.g. propylene glycol, which is dispersed in the mixture to be flavoured.

In order that the invention may more easily be understood, preferred embodiments are described in the following Examples, given by way of illustration only. All parts and percentages are by weight.

EXAMPLE 1

One part by weight of cocoa containing 10 to 12% fat and ground to 120 mesh is mixed with three parts water and the mixture is heated to 88° C. for 15 minutes with stirring to produce a hydrated cocoa slurry. This slurry is cooled to 49° C. and 0.001 parts of the enzyme "Clarase", having amylase activity, is added. The slurry is then held at 49° C. for 45 minutes during which time the high molecular weight compounds in the cocoa are

hydrolysed. After hydrolysis the temperature is raised to 71° C. and 0.25 parts of sugar are stirred into the slurry.

0.048 parts of 50% sodium hydroxide solution and 2.0 parts water are added and the mixture is heated to 93° C. and stirred in an open vessel with a copious supply of air. After one hour and again after two hours at 93° C. another charge of 0.048 parts of 50% sodium hydroxide solution and 2 parts water is added. Stirring is continued for a total of five hours at 93° C. to yield a fully dutched product.

To make a cocoa-flavouring beverage, the dutched slurry is centrifuged in a conventional centrifuge to remove coarse particles and the centrifuged slurry is made into a syrup according to the following recipe:

Slurry (16.6% solids)	1.97 parts
Water	1.71
Sucrose	7.27
Liquid invert sugar	3.35

This syrup may then be diluted with carbonated water to give a soft drink. A suitable dilution is 14.3% syrup, 85.7% carbonated water.

If the cocoa is required as a solid, the dutched slurry may be dried on a suitable double drum atmospheric dryer of conventional type (steam pressure 7.3 kg/cm^2; drum spacing 0.013 cms) until a solid is obtained and the solid is ground in a micropulveriser and sifted to 170 mesh. On being dispersed in milk this material gives a pleasant deep, red/brown coloured beverage.

To prepare a colouring agent for decorative icings, a mixture may be prepared having the following composition:

Dried dutched cocoa slurry	22.8% by weight
Propylene glycol	68.2%
Lecithin	9.0%

This colouring material may be incorporated at a concentration of about 5 to 15% in a wide variety of decorative icings, of which the following approximate composition is typical:

Skim milk solids	20.5%
Fat	35.5%
Sugar	43.0%
Water	0.7%
Flavourings	0.3%

The resulting icing has a deep red colour.

EXAMPLE 2

One part by weight of cocoa containing 10 to 12% fat and ground to 120 mesh is mixed with two parts water at 55° C. and heated to 77° C. until a uniform hydrated cocoa slurry is produced. 0.0005 parts by weight of the enzyme "Rhozyme "H-39", having amylase activity is added and the slurry is heated at 77° C. for 15 minutes.

0.068 parts of 50% sodium hydroxide solution are added and the mixture is heated by steam injection in a jacketed vessel for five hours at 88° C. A copious supply of air is also fed to the mixture and water is added as necessary to replace vapour losses.

After dutching the liquid slurry is dried in an atmospheric double drum drier at a steam pressure of 7.3 kg/cm^2 and 0.01 cm drum spacing. The dried cocoa is then ground in a micropulveriser and sifted to a 170 mesh particle size.

To make a cocoa-flavoured milk drink, this dried cocoa is dispersed in milk, giving a pleasant dark red colour.

I claim:

1. A process for making a cocoa product which consists essentially of:

(a) mixing a low fat cocoa, obtained from roasted cocoa beans, with water to form a cocoa slurry;

(b) enzymatically hydrolysing the cocoa slurry with an amylase-containing enzyme;

(c) adding alkali to the resulting hydrolysed slurry; and

(d) heating the alkali containing slurry.

2. A process according to claim **1**, in which the alkali is added to the slurry in successive charges.

3. A process according to claim **1**, in which sugar is added to the slurry after hydrolysis and before addition of alkali.

4. A process according to claim **1**, in which the hydrolysed slurry is mixed with about 0.25 parts by weight of sugar per 1 part cocoa before addition of alkali, the mixture is agitated for about five hours at about 93° C. and successive charges of about 0.024 parts by weight of sodium hydroxide, per 1 part cocoa, with about 2 parts water are added at the start of the agitation and at intervals of about 1 and 2 hours after the start of the agitation.

5. A process according to claim **1**, wherein, after the slurry has been enzymatically hydrolysed and heated, the slurry is subsequently centrifuged to produce a clear extract.

6. A process according to claim **5**, in which the clear extract is dried to a powder.

7. A cocoa extract prepared by the process according to claim **5**.

8. A foodstuff containing an extract according to claim **7** as a flavouring.

9. A cocoa product made by the process according to claim **1**.

10. A process for making a chocolate product which consists essentially of:

(a) heating a mixture of a low fat cocoa, obtained from roasted cocoa beans, and water to form a hydrated slurry;

(b) enzymatically hydrolysing the slurry by adding an amylase-containing enzyme preparation thereto;

(c) adding to the hydrolysed slurry about 0.034 parts by weight of sodium hydroxide per part by weight of cocoa; and

(d) heating the sodium hydroxide containing slurry for about five hours at 88° C.

11. A process for making a cocoa product which consists essentially of:

(a) roasting raw cocoa beans;

(b) deshelling the roasted cocoa beans;

(c) grinding the deshelled, roasted cocoa beans to form a cocoa liquor;

(d) removing cocoa fat from the cocoa liquor to form a low-fat cocoa;

(e) mixing the low-fat cocoa with water to form a cocoa slurry;

(f) enzymatically hydrolysing the cocoa slurry with an amylase-containing enzyme;

(g) adding alkali to the resulting hydrolysed slurry; and

(h) heating the alkali containing slurry.

12. A process for making a chocolate product which consists essentially of:

(a) roasting raw cocoa beans;

(b) deshelling the roasted cocoa beans;

(c) grinding the deshelled, roasted cocoa beans to form a cocoa liquor;

(d) removing cocoa fat from the cocoa liquor to form a low-fat cocoa;

(e) heating a mixture of the low-fat cocoa and water to form a hydrated slurry;

(f) enzymatically hydrolysing the slurry by adding an amylase-containing enzyme preparation thereto;

(g) adding to the hydrolysed slurry about 0.034 parts by weight of sodium hydroxide per part by weight of cocoa; and

(h) heating the sodium hydroxide containing slurry for about five hours at 88° C.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 4,343,818
DATED : August 10, 1982
INVENTOR(S) : Ingmar B. Eggen

It is certified that error appears in the above—identified patent and that said Letters Patent is hereby corrected as shown below:

In the Title Page, under the subheading "FOREIGN PATENT DOCUMENTS", "49-33137" should read --50-33137--.

At Column 2, line 2, "hydrated to bring" should read --hydrated slurry to bring--.

Signed and Sealed this

Fifth Day of October 1982

[SEAL]

Attest:

GERALD J. MOSSINGHOFF

Attesting Officer

Commissioner of Patents and Trademarks

EXHIBIT J

US005888562A

United States Patent [19]

Hansen et al.

[11] **Patent Number: 5,888,562**

[45] **Date of Patent: Mar. 30, 1999**

[54] **ENZYMATIC TREATMENT OF COCOA**

[75] Inventors: **Carl Erik Hansen**, Epalinges, Switzerland; **Anthony Klueppel**, Dublin, Ohio; **Eric Raetz**, Lausanne, Switzerland

[73] Assignee: **Nestec S.A.**, Vevey, Switzerland

[21] Appl. No.: **660,901**

[22] Filed: **Jun. 10, 1996**

[30] **Foreign Application Priority Data**

Jun. 20, 1995 [EP] European Pat. Off. 95201668

[51] **Int. Cl.**[6] **A23G 1/00**

[52] **U.S. Cl.** **426/45**; 426/44; 426/52; 426/631

[58] **Field of Search** 426/45, 44, 49, 426/52, 593, 658, 660, 631, 533, 534, 650

[56] **References Cited**

U.S. PATENT DOCUMENTS

800,448	9/1905	Kerr	426/45
1,854,353	4/1932	Wallertstein	426/45
2,965,490	12/1960	Rusoff	426/45
3,970,520	7/1976	Feldman et al. .	

FOREIGN PATENT DOCUMENTS

0298419	1/1989	European Pat. Off. .
0420979	4/1991	European Pat. Off. .
0461261	12/1991	European Pat. Off. .
2406665	5/1979	France .
679629	3/1992	Switzerland .

OTHER PUBLICATIONS

Shimazki et al. JP 07–79749 Patent Abstracts of Japan, Mar. 1995, abstract only.

Patent Abstract of Japan, vol. 006, No. 102 (C–107), 11 Jun. 1982 & JP–A–57 033547 (Fuji Oil Co) 23 Feb. 1982.

Primary Examiner—Leslie Wong
Attorney, Agent, or Firm—Pennie & Edmonds LLP

[57] **ABSTRACT**

Process for treating a cocoa nib or liquor, in which a nib or a liquor is prepared from cocoa beans fermented for 1 to 15 days, it is mixed with at least one technical protease in an aqueous medium at pH 3–8, and the mixture is incubated for a time and at a temperature sufficient to obtain at least 10 μmol of hydrophobic amino acids per gram of dry matter and at least 1.4 times more hydrolysis products, compared with those initially present in the cocoa beans. Composition comprising a nib or a liquor from cocoa beans fermented for about 1 to 15 days, and a technical protease and/or a technical invertase. Cocoa obtained by roasting the composition according to the invention.

15 Claims, 1 Drawing Sheet

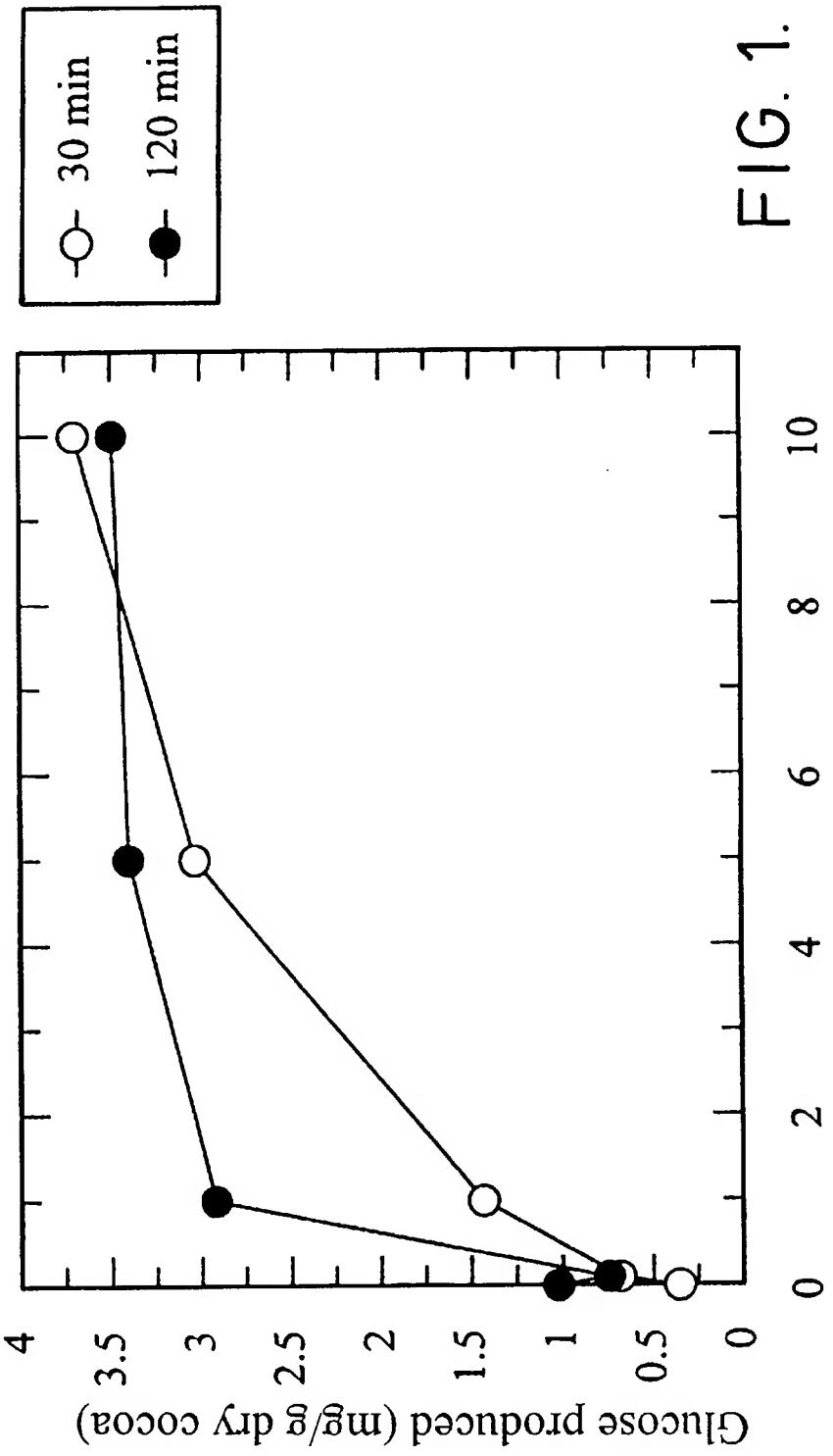

30 min
120 min
Glucose produced (mg/g dry cocoa)
0
0.5
1
1.5
2
2.5
3
3.5
4
0
2
4
6
8
10

FIG. 1.

ENZYMATIC TREATMENT OF COCOA

TECHNICAL FIELD

The invention relates to a process for the enzymatic treatment of a cocoa nib or liquor for improving its flavor precursor composition, and which makes it possible to use a wide range of cocoa beans in various fermentation states.

BACKGROUND

The quality of a chocolate is directly influenced by the geographic and genetic origin, and the conditions for treating the cocoa beans, from their cultivation in the field up to their processing in the factory. Once harvested, cocoa beans are thus subjected, in their country of origin, to a fermentation and a natural drying which are intended to cause the appearance of the flavor precursors. Unfortunately, the harvesting at maturity of the beans and the conditions for their fermentation are not always adequately controlled. Furthermore, the three principal types of cocoa trees of the species *Theobroma cacao*, called Criollo, Forastero and Trinitario, each produce beans having a different composition. Finally, the dried beans can also be damaged during their transport to the countries specialized in the processing of the beans. Industry must therefore address a wide variability in the composition of a batch of cocoa beans (see for example Smaffer M., The Manufacturing Confectioner, 92–94, June 1994).

The fermented and dried cocoa beans are then traditionally crushed to a greater or lesser extent, the outer coats are separated, and then they are subjected to roasting, combined where appropriate with alkalization, which are intended to cause the cocoa flavor and colour to appear. The roasting step involves Maillard reactions between the reducing sugars and the products of the degradation of proteins, especially the amino acids and the hydrolysis products (Wood and Lass, Cocoa, Longman Scientific & Technical, Longman Group UK, England, 1985, ISBN 0-582-46352-1).

The flavor precursors appear only during the natural fermentation of the beans, as a result of hydrolysis reactions. Experiments involving in vitro incubation of unfermented cocoa beans or bean fragments have thus shown that these hydrolysis reactions are dependent on the pH, the temperature and the compartmentation of the enzymes and of the substrates in the bean. Furthermore, the hydrolysis reactions are also sensitive to the presence of polyphenols. It is thus advantageous to extract the polyphenols from the beans using acetone, and also to incubate the said beans in acetic acid in order to decompartmentalize the enzymes and the substrates (Biehl B. et al., J. Sci. Food. Agric., 33, 1280–1290, 1982).

Furthermore, other studies have shown that cocoa beans comprise at least three protolytic activities involved in the appearance of the cocoa flavor precursors, namely an endoprotease having an optimum activity at pH 3.5, a carboxypeptidase having an optimum activity at pH 5.8, and an aminopeptidase having an optimum activity at pH 7. Experiments involving hydrolysis of purified cocoa bean globulin (protein having two bands of 31 kD and 47 kD on an SDS-PAGE chromatography gel), from which the polyphenols have been extracted, with commercial proteases and/or purified cocoa endoprotease and carboxypeptidase have shown that it was preferable to hydrolyse the globulin successively with cocoa endoprotease at pH 3.5, then with cocoa carboxypeptidase or a commercial carboxypeptidase at pH 5–6. In this way, a hydrolysis product and amino acid composition is obtained which is suitable for obtaining a cocoa flavor during subsequent roasting of the mixture in the presence of reducing sugars (Voigt J. et al., Food Chemistry, 50, 177–184, 1994).

Moreover, U.S. Pat. No. 2,965,490 describes a process for the in vitro hydrolysis of unfermented cocoa beans (green cocoa beans), intended to replace the natural fermentation of the beans. To this end, the green cocoa bean proteins are hydrolysed with acid or enzymatically, the carbohydrates in the said beans are hydrolysed enzymatically to produce simple sugars, and both hydrolysates are allowed to react under anhydrous conditions at a temperature and for a time sufficient to produce an aromatic factor. However, it should be stated that the polyphenols in the green seeds limit particularly the enzymatic hydrolysis of the storage proteins (see Comparative Example 1 below).

In the final analysis, the processes and studies described above are evidently intended to replace the natural fermentation of the cocoa beans with a controlled enzymatic hydrolysis of the green beans (problem caused by the polyphenols) or of their purified proteins (from which the polyphenols have been extracted). Furthermore, the quality and the quantity of flavor precursors necessary for the creation of a good cocoa flavor during roasting are not yet known.

SUMMARY OF THE INVENTION

The aim of the present invention is to overcome the variability in the flavor precursor composition of fermented cocoa beans, and to confer an optimum flavor precursor composition on a cocoa bean nib or liquor.

To this end, in the process according to the present invention, a nib or a liquor is prepared from cocoa beans fermented for 1 to 15 days, it is mixed with at least one protease in an aqueous medium at pH of 3–8, and the mixture is incubated for a time and at a temperature sufficient to hydrolyse the proteins and the peptides.

Preferably, the mixture is incubated for a time and at a temperature sufficient to obtain at least 10 μmol of hydrophobic amino acids per gram of dry matter and/or at least 1.4 times more hydrolysis products, compared with those initially present in the cocoa beans.

The present process makes it possible to enhance the hydrolysis of the storage proteins in the cocoa beans, which initially takes place during the natural fermentation of the beans, until sufficient quantities and a correct amino acid and hydrolysis product composition are obtained.

The subsequent roasting of the mixture according to the invention then makes it possible to obtain a good cocoa flavor, which may even be stronger and more concentrated, compared with that obtained after roasting of traditionally fermented cocoa beans.

It is also possible to use cocoa beans taken at various stages of fermentation, such as for example underfermented beans not containing enough flavor precursors, overfermented beans not containing the correct flavor precursor composition, or poorly fermented beans such as acidic beans containing a poor flavor precursor composition. Likewise, the cocoa beans may be of different plant and geographic origins. The present process thus makes it possible to homogenize the flavor precursor composition of a mixture of beans of different origins and stages of fermentation.

Furthermore, the hydrolysis of a cocoa nib or liquor by technical enzymes is surprising because of their sensitivity to the polyphenols in the beans. It has been possible to show that beans fermented naturally for at least 1 day have a

sufficiently low polyphenol level for the technical enzymes not to be significantly inhibited in the present process. On the other hand, green cocoa beans have a polyphenol level which is too high for them to be used in the present process.

In particular, the addition of an invertase makes it possible to advantageously increase the natural glucose and fructose content of the mixture, which promotes the formation of flavor during subsequent roasting of the mixture.

Finally, the possible use of various technical enzymes in the present invention opens the possibility of creating variants of cocoa flavor which can be appreciated by the consumer.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a graphical representation of the quantity of glucose produced by an invertase in a mixture of water and nib of insufficiently fermented cocoa beans, according to the treatment time and as a function of the quantity of invertase added.

DETAILED DESCRIPTION OF THE INVENTION

One enzymatic activity unit is defined in the rest of the description as μmol of product converted per minute. Likewise, the percentages are given by weight unless otherwise indicated.

The expression "underfermented or insufficiently fermented cocoa beans" designates beans traditionally fermented for about 1 to 4 days and then dried, in which the proteins exhibit, in SDS-PAGE chromatography on a polyacrylamide gel, 2 visible bands corresponding to the 21 kD and 31 kD/47 kD storage proteins (see WO91/00913 and WO91/00914). Moreover, the beans do not have a sufficient quantity of amino acids and peptides to form a cocoa flavor during subsequent roasting.

The expression "well fermented cocoa beans" designates beans fermented and dried traditionally for about 2 to 10 days, and in which the proteins exhibit, in SDS-PAGE chromatography on a polyacrylamide gel, a visible band corresponding to the 21 kD storage protein, the two bands corresponding to the 21 kD/47 kD protein being partially or completely degraded. Moreover, these beans have a sufficient quantity of amino acids and peptides to form a cocoa flavor during subsequent roasting.

The expression "overfermented cocoa bean" designates beans fermented and dried traditionally for about 7 to 15 days, in which the proteins do not exhibit, in SDS-PAGE chromatography on a polyacrylamide gel, visible and distinct bands corresponding to the 21 kD and 31 kD/47 kD storage proteins. Moreover, these beans have a sufficient quantity of amino acids, but an insufficient quantity of peptide to form a cocoa flavor during subsequent roasting.

Finally, for the purposes of the present invention, a nib is obtained by conventional crushing of fermented or unfermented cocoa beans, and a cocoa liquor is obtained by grinding the beans or the nib to a greater or lesser extent until the cocoa butter is released from the cells.

To carry out the present process, a nib or a liquor is prepared from cocoa beans fermented for 1 to 15 days. It is therefore possible to use, mixed or otherwise, cocoa beans taken at various stages of fermentation, such as underfermented, well fermented, overfermented or poorly fermented beans. It is also possible to use, mixed or otherwise, cocoa beans obtained from various genotypes of cocoa trees, *Theobroma cacao* Criollo, Forastero and/or Trinitario. The nib or the liquor can be reduced to a fine powder; however, it should be noted that if the nib or liquor is treated enzymatically at a temperature higher than 35°–45° C., the liquor or nib pieces will melt, thus making it possible for the enzymes to reach the innermost material in the mixture.

The nib or the liquor is then mixed with at least one protease in an aqueous medium at pH 3–8. The protease may be chosen alone or in combination, from the group consisting of endoproteases, carboxypeptidases and aminopeptidases. The pH of the aqueous medium may be adjusted by adding an inorganic or organic acid, or a buffer chosen from those commonly used in industrial food processing, especially buffers based on citrate, phosphate or acetate. In particular, a pH of 3–5 may be preferred so as to also activate the endogenous endoproteases in the bean; however, it is preferable to choose, consequently, a technical protease which is active in this acidity range.

The mixture may comprise about 10–80% of a cocoa nib or liquor, especially 20–70%, and 1–100 units of protease per gram of mixture, especially 0.01–5% (weight/weight) of a commercial technical protease preparation.

To carry out the present process, the mixture is then incubated for a time and at a temperature sufficient to hydrolyse the proteins and peptides in the mixture.

Preferably, the mixture is incubated for a time and at a temperature sufficient to obtain at least 10 μmole of hydrophobic amino acids per g of dry matter and/or at least 1.4 times more, even 1.7 or even 2 times more hydrolysis products, compared with those initially present in the treated cocoa beans. In this context, the quantity of the same hydrolysis products (peptides and amino acids) which is found in the nibs obtained before and after treatment according to the invention can be compared. It is also possible to take into account the appearance of new hydrolysis products, relative to those present in the untreated nib according to the invention, while being confined, however, to those which appear significantly during the natural fermentation of green cocoa beans, for example. In particular, the quantity of four hydrolysis products having a retention time of about 9, 17, 24 and 29.5 min is compared during a chromatography on a C18 reversed-phase HPLC column (No. 218TP54 Vydac; U.S.A.) characterized by a constant flow rate of 1 ml/min and eluents consisting of an aqueous solution comprising 0.1% trifluoroacetic acid and 2% acetonitrile for 10 min, followed by a linear gradient comprising 0.1% trifluoroacetic acid and 2% to 52.7% acetonitrile for 50 min. The eluted hydrolysis products are detected at 215 and 280 nm.

Likewise, it is possible to take into account, as hydrophobic amino acids, only those predominantly present in the nib treated according to the invention, in particular phenylalanine, leucine and alanine.

To obtain a sufficient quantity of hydrophobic amino acids and of hydrolysis products, the mixture can be incubated at 10°–60° C. for 30 min to 20 h, for example. However, the hydrolysis time and temperature will need to be chosen as a function of the medium, the type of enzyme, the level of fermentation of the beans and the origin of the beans.

In a first specific embodiment of the present invention, a nib or liquor is prepared from cocoa beans fermented for 1 to 15 days, it is mixed with an aqueous medium at pH 3–6, the mixture is incubated at 40°–60° C. for 10 min to 20 h so as to promote the action of the cocoa endoprotease, the pH of the medium is adjusted to pH 4–8, at least one technical protease is added to it, and it is incubated at 10°–60° C. for

5 min to 20 h, so as to obtain hydrolysis of the proteins and of the peptides, but preferably at least 10 μmol of hydrophobic amino acids per gram of dry matter and/or at least 1.4 times more hydrolysis products (peptides and amino acids), compared with those initially present in the cocoa beans.

In a second specific embodiment of the present invention, a nib or liquor is prepared from cocoa beans fermented for 1 to 15 days, it is mixed with an aqueous medium at pH 4–8, at least one protease is added to it, and it is incubated at 10°–60° C. for 5 min to 20 h, so as to obtain hydrolysis of the proteins and the peptides, but preferably at least 10 μmol of hydrophobic amino acids per gram of dry matter and/or at least 1.4 times more hydrolysis products (peptides and amino acids), compared with those initially present in the cocoa beans. Preferably, a pH range is chosen in which the cocoa endoprotease as well as the technical protease remain active.

Finally, in a third specific embodiment of the present invention, at least one enzyme chosen from the group consisting of invertases, glycosidases, cellulases, pectinases and oxydases may be added to the reaction mixture. Preferably, at least one of the said enzymes is added in an amount of 0.01 to 5% of a commercial enzyme preparation, or 1–100 units/g of mixture. The reaction mixture should be understood to be one of the mixtures described above, which is incubated for a certain period (comprising the technical protease or otherwise).

In particular, the technical protease and/or cocoa endoprotease treatment is combined with a technical invertase. This treatment makes it possible advantageously to produce hydrophobic amino acids and other hydrolysis products which will combine with glucose and fructose, during subsequent roasting, to give a more chocolatelike flavor (which evokes a rich taste). Unexpectedly, the cocoa endoprotease, the technical invertase and protease can be used in a single step (second embodiment of the invention), by choosing, however, a pH range which is favorable to the activity to all the enzymes (the endoprotease, the technical protease and the invertase).

If invertase is not used, it may also be advantageous to add at least 0.1% of a reducing sugar to the final mixture before roasting, such as for example glucose and/or fructose in an amount of 0.1 to 5%.

Finally, after having carried out the present process, the mixture can be preserved by inactivating the enzymes using heat (80°–120° C. for 1 to 60 min) or a treatment at high hydrostatic pressure (greater than 500,000 kPa, for example. It is also possible to dry the mixture by freeze-drying, by spray-drying, by vacuum suction, or by evaporation of the water during gentle heating of the mixture. Preferably, the mixture is dried until a moisture content of the mixture of less than 10%, especially 5%, is reached. The mixture may also be subjected to conventional roasting and/or alkalization, like that described in EP 0,226,727.

Preferably, after having carried out the present process, the pH of the mixture is adjusted to 5–6, it is dried and it is roasted.

The invention also relates to the compounds comprising a nib or liquor from cocoa beans fermented for 1 to 15 days, and a technical protease and/or a technical invertase. If the enzymes are still active, the compositions may contain at least 1 enzymatic activity unit per gram of composition. In the case where these enzymes are inactive, for example following a heat denaturation treatment, they can, nevertheless, still be identified with the aid of appropriate antibodies, indicating the previous use of this enzyme.

These compositions may therefore comprise a cocoa nib or liquor prepared from a mixture of beans in various states of fermentation and/or obtained from various genotypes of cocoa trees. These compositions may be one of the compositions presented above within the framework of the present process. The invention therefore also covers the dried compositions, comprising the addition of glucose and/or fructose, and in particular the cocoas (powder, nib, liquor and the like) obtained by roasting the said compositions. These compositions differ in particular from the prior art because they are derived from a mixture comprising beans taken in various states of fermentation and/or obtained from various genotypes of cocoa trees, and active or inactive technical proteases and/or invertases.

The present invention is described in greater detail below with the aid of the examples which follow. These examples are preceded by a description of various tests, and a brief presentation of the figure. It goes without saying, however, that these examples are given by way of illustration of the subject of the invention and do not constitute in any manner a limitation thereof.

Amino acid analysis

The inactivated mixture according to the invention is subjected to an ultrasonic bath for 10 min, it is homogenized for twice 1 min at 9600 rpm (Polytron), it is centrifuged for 10 min at 10,000 g, the supernatant is harvested, it is filtered and then its amino acid content is analysed by means of the ACCQTag® kit (Waters, U.S.A.).

For that, 20 μl of sample and standard are mixed with 140 μl of a borate buffer, 40 μl of a reagent comprising 6-aminoquinolyl-N-hydroxysuccinimidyl carbamate (AQC) are added, the mixture is vortexed and it is allowed to stand at room temperature for 1 min, it is heated at 55° C. for 7 min, it is injected into a C18 reversed-phase HPLC column (Nova-Pak C18, 4 μm; U.S.A.), and the amino acids derived at 36.5° C. are eluted at a flow rate of 1 ml/min, in a gradient: 100% of solvent A for 10 min, 98% of solvent A for 10.5 min, 93% of solvent A for 26 min, 90% of solvent A for 30 min, 67% of solvent A for 43 min, 30% of solvent A for 53 min, 100% of water for 54 min and 100% of an acetonitrile/water solvent (65%/35%) for 60 min (solvent A=phosphate buffer supplied by Waters).

The derived and eluted amino acids are detected at 395 nm by an Applied Biosystem model 980 detector. The amino acids of the mixture are then quantified in μmol per gram of dry mixture, in comparison with the standard samples derived and eluted under the same conditions.

Analysis of the hydrolysis products

Methanol is added to the inactivated mixture according to the invention up to a concentration of 70%, 1.5 ml of 70% methanol and 100 mg of polyvinylpyrrolidone (PVPP) are added, the mixture is kept under gentle stirring for 1 h at room temperature, it is centrifuged twice for 10 min at 20,000 g, the supernatant is harvested, the methanol is removed by vacuum suction, 0.35 ml of water is added to the pellet, the solution is centrifuged for 5 min at 20,000 g, it is filtered and then its hydrolysis product content is analysed by elution on a C18 reversed-phase HPLC column (No. 218TP54 Vydac; U.S.A.) at a flow rate of 1 ml/min in 0.1% trifluoroacetic acid and 2% acetonitrile in water for 10 min, followed by a linear gradient comprising 0.1% trifluoroacetic acid and 2 to 52.7% acetonitrile for 50 min. The hydrolysis products eluted are detected at 215 and 280 nm.

Within the framework of the present invention, the increase in the quantity of hydrolysis products (peptides and amino acids) in the mixture treated according to the invention, relative to those present in the untreated mixture,

is determined by comparing the areas of the elution peaks of four hydrolysis products having a retention time of 9, 17, 24 and 29.5 min. These areas are generally found during the traditional fermentation of cocoa beans from the cocoa trees *Theobroma cacao* Trinitario, Criollo and Forastero. It cannot be excluded, however, that other hydrolysis products may also appear during the traditional fermentation of cocoa beans obtained from some specific genotypes of cocoa trees.

Analysis of the sugars

The inactivated mixture according to the invention is incubated for 30 min at 60° C., with stirring, it is allowed to stand at room temperature for 15–30 min, it is centrifuged twice at 20,000 g for 5 min, the supernatant is filtered on a C18 Waters Sep-Pak cartridge, the filtrate is again filtered on a Sartorius Minisart filter (SRP15, No. 1755K), and its glucose content determined by the "God-Perid" spectrophoto-metric method with the aid of a Boehringer-Mannheim No. 124028 kit (Germany), or alternatively by HPLC.

Sensory analysis

The hydrolysed liquor or nib according to the invention is heat-inactivated, the pH is adjusted to 5–6, it is dried by evaporation of the water under vacuum during gentle heating (<60° C.) until the moisture content is less than 10%, and then it is roasted in an oven at 130° C. for 15 min. The flavors generated by the roasting are then evaluated by a panel of individuals used to evaluating such flavors.

All the flavors are compared with those produced by cocoa bean nibs or liquors, simply dried and roasted under the same conditions, which are derived from insufficiently fermented Sanchez and Sulawesi cocoa beans, and well fermented Ghana cocoa beans (beans known to persons skilled in the art).

Each sample is evaluated for the following sensations "cocoa flavor" (derived from Ghana beans), "acidity" (qualifies the basic taste generated by dilute aqueous solutions of most acids), "bitterness" (qualifies the basic taste generated by dilute solutions of various substances such as quinine, perceived on the top of the tongue and at the back of the palate), "astringency" (the term has been broadened to the entire actions of polyphenols which result in sensations of a physical nature, from the suppression of unctuousness to the astringency in the medical sense which covers constriction and/or crispation of the tissues), "fruity" (taste note belonging to the bouquet and which evokes a fruit which has reached maturity: apple, banana, pear and the like), "flowery" (corresponds to an olfactory sensation evoking flowers in general: rose, jasmin, hyacinth, lilac and the like), "smoky" (taste and odour of smoked ham; defect resulting in general from drying the cocoa beans after fermentation by means of a wood fire), "musty", and "raw" (feature of insufficiently roasted cocoas where the flavor has not developed; linked to astringency and acidity; evokes raw groundnuts).

Comparative Example 1

A green cocoa bean nib from *Theobroma cacao* Trinitario ICS-95 is prepared conventionally, 100 mg of the said nib and, where appropriate, 100 mg of PVPP, which forms a complex with the polyphenols, are mixed with 1 ml of a 200 mM citrate buffer pH 4. The mixture is incubated for 2 h at 50° C., its pH is adjusted with 1 ml of a 200 mM citrate buffer pH 7, where appropriate 40 μl of phenoxypeptidase A (0.06 units/μl, Sigma), are added to it, it is incubated at 25° C. for 1 h, and then the reaction is stopped by heating the mixture at 95° C. for 5 min.

The degree of hydrolysis of the cocoa proteins is then analysed by determining, by means of the methods described above, the free amino acid content in the treated nibs and the areas of the elution peaks of four hydrolysis products in the initial nib and the treated nibs (products associated with the natural fermentation of the beans: amino acids and peptides).

The results presented in Table 1 below show that autolysis of the nib at pH 4 and at pH 7 does not make it possible to obtain a significant increase in the flavor precursors, compared with those initially present in the green cocoa beans. On the other hand, autolysis, at pH 4, of the nib comprising PVPP, followed by an enzymatic hydrolysis of the proteins at pH 7 makes it possible to obtain a significant increase in the flavor precursors. The polyphenols in the green cocoa beans therefore have a substantial inhibitory effect.

TABLE 1

Enzymatic treatment	Addition of PVPP	Amino acids (μmol/g dry weight) Total	Hydrophobic	Areas for the hydrolysis products (arbitrary units) Peak 1	Peak 2	Peak 3	Peak 4
no	–	15.9	2.5	604	551	716	—
yes	–	26.8	8.3	695	1224	696	—
yes	+	34.9	12.1	1559	2847	2854	1804

(The retention time for the hydrolysis products 1 to 4 is 9, 17, 24 and 29.5 min respectively)

Comparative Example 2

Nibs are prepared conventionally from cocoa beans from *Theobroma cacao* Trinitario ICS-95 which had been traditionally fermented for 1, 2, 3, 4, 5 and 7 days, and then dried. The degree of hydrolysis of the nib proteins is then analysed by determining, by means of the method described above, the areas of the elution peaks of four hydrolysis products in the fermented nibs (products associated with the natural fermentation of the beans). The results are presented in Table 2 below.

The analysis of the nib proteins by SDS-PAGE chromatography on a polyacrylamide gel shows an intense degradation of the 31 kD and 47 kD bands in the case of the beans fermented for at least 3 days. On the other hand, the 21 kD band is not degraded in the case of the beans fermented for 1 to 7 days.

The various nibs are roasted at 130° C. for 15 min in an oven. Sensory analysis of the flavor given by the nibs shows that a 3-day fermentation of the beans is sufficient to obtain an acceptable cocoa flavor.

EXAMPLE 1

Nibs are prepared conventionally from cocoa beans from *Theobroma cacao* Trinitario ICS-95 which have been traditionally fermented for 1, 2, 3, 4, 5 and 7 days, and then dried. 1 ml of 200 mM citrate buffer pH 4 is then mixed with 100 mg of each type of nib, the mixture is incubated for 2 h at 50° C., its pH is adjusted with 1 ml of a 200 mM citrate buffer pH 7, 40 μl of carboxypeptidase A (0.06 units/μl, Sigma) are added to it, it is incubated at 25° C. for 1 h and then the reaction is stopped by heating the mixture at 95° C. for 5 min. The degree of hydrolysis of the cocoa proteins is then analysed by determining, by means of the methods described above, the free amino acid content and the areas of the elution peaks of four predominant hydrolysis products of the nibs (products associated with the natural fermentation of the beans).

The results presented in Table 2 show that it is possible to increase at least 1.4-fold the hydrolysis product content in a nib obtained from underfermented or well fermented cocoa beans. Furthermore, the hydrophobic amino acid content of all the treated nibs and of the nibs fermented for 3 to 7 days is always greater than 10 μmol per gram of dry matter.

TABLE 2

Days of fermentation	Enzymatic treatment	Areas for the hydrolysis products (arbitrary units) Peak 1	Peak 2	Peak 3	Peak 4	Increase in the hydrolysis product
1	No	565	1017	833	—	
1	Yes	1181	2626	1191	—	× 2.06
2	No	1072	2393	1190	—	
2	Yes	1880	4044	1968	—	× 1.70
3	No	1600	3643	1595	170	
3	Yes	2083	5074	2618	890	× 1.52
4	No	1583	3444	1794	202	
4	Yes	3107	6051	2836	596	× 1.79
5	No	1663	3383	1249	270	
5	Yes	2230	4719	2486	—	× 1.43
7	No	2061	3971	1202	267	
7	Yes	2862	5555	2563	—	× 1.46

(The retention time for the hydrolysis products 1 to 4 is 9, 17, 24 and 29.5 min respectively)

EXAMPLE 2

Nibs are prepared conventionally from cocoa beans from *Theobroma cacao* Trinitario ICS-95 which have been traditionally fermented for 1, 2, 3, 4, 5 and 7 days, and then dried. 100 μl of 200 mM citrate buffer pH 4 are then mixed with 100 mg of each type of nib, the mixture is incubated for 2 h at 50° C., its pH is adjusted with 100 μl of a 200 mM citrate buffer pH 7, 40 μl of carboxypeptidase A (0.06 units/μl, Sigma) are added to it, it is incubated at 25° C. for 1 h and then the reaction is stopped by heating the mixture at 95° C. for 5 min. The degree of hydrolysis of the cocoa proteins is then analysed by determining, by means of the methods described above, the free amino acid content and the areas of the elution peaks of four predominant hydrolysis products of the nibs (products associated with the natural fermentation of the beans). The results are similar to those obtained in Example 1.

EXAMPLE 3

A liquor is prepared from insufficiently fermented cocoa beans obtained from various genotypes of *Theobroma cacao*. The proteins of these beans exhibit, in SDS-PAGE chromatography on a polyacrylamide gel, 3 visible bands of proteins corresponding to the 21 kD and 31 kD/47 kD storage proteins.

The hydrolysis product content of a portion of the liquor are determined by means of the methods described above. 1 ml of 200 mM citrate buffer pH 4 is then mixed with 100 mg of a portion of the liquor, the mixture is incubated for 2 h at 50° C., its pH is adjusted with 1 ml of a 200 mM citrate buffer pH 7, 40 μl of carboxypeptidase A (0.06 units/μl, Sigma) are added to it, it is incubated at 25° C. for 1 h and then the reaction is stopped by heating the mixture at 95° C. for 5 min. The degree of hydrolysis of the proteins is finally analysed by determining the hydrolysis product content of the liquor (methods above).

The results presented in Table 3 below show that the treatment according to the invention makes it possible to significantly increase the content of flavor precursors in a liquor obtained from a mixture of underfermented beans.

TABLE 3

Enzymatic treatment	Amino acids (μmol/g dry weight) Total	Hydrophobic	Areas for the hydrolysis products (arbitrary units) Peak 1	Peak 2	Peak 3	Peak 4
no	22.2	7.7	—	1451	613	—
yes	35.9	14.7	771	2359	1115	724

(The retention time for the hydrolysis products 1 to 4 is 9, 17, 24 and 29.5 min respectively)

EXAMPLE 4

500 g of insufficiently fermented cocoa beans obtained from various genotypes of *Theobroma cacao* are treated enzymatically in a manner identical to that described in Example 3. The pH of the inactivated mixture is then adjusted to 5–6, 0.3% glucose and 0.6% fructose are added, the mixture is dried by evaporation of water under vacuum during gentle heating (60° C.) until the moisture content is less than 5%, it is roasted in an oven at 130° C. for 15 min, and the flavor given off by the roasted mixture is analysed by the sensory test described above. The results show that the nibs from underfermented beans, treated according to the invention and roasted, have an intense flavor characteristic of a cocoa flavor derived from well fermented and roasted beans.

EXAMPLE 5

A liquor is prepared conventionally from overented cocoa beans obtained from various genotypes of *Theobroma cacao*. The proteins of these beans do not exhibit, in SDS-PAGE chromatography on a polyacrylamide gel, any visible bands of proteins corresponding to the 21 kD and 31 kD/47 kD storage proteins.

The hydrolysis product content of a portion of the liquor is determined by means of the methods described above. 1 ml of 200 mM citrate buffer pH 4 is then mixed with 100 mg of a portion of the liquor, the mixture is incubated for 2 h at 50° C., its pH is adjusted with 1 ml of a 200 mM citrate buffer pH 7, 40 μl of carboxypeptidase A (0.06 units/μl, Sigma) are added to it, it is incubated at 25° C. for 1 h and then the reaction is stopped by heating the mixture at 95° C. for 5 min. The degree of hydrolysis of the proteins is finally analysed by determining the hydrolysis product content of the liquor (methods above).

The results presented in Table 4 below show that the treatment according to the invention makes it possible to significantly increase the content of flavor precursors in a liquor obtained from a mixture of overfermented beans.

TABLE 4

Enzymatic treatment	Amino acids (μmol/g dry weight) Total	Hydrophobic	Areas for the hydrolysis products (arbitrary units) Peak 1	Peak 2	Peak 3	Peak 4
no	49.5	19.2	960	2192	727	—
yes	59.6	25.8	2102	4508	3026	—

(The retention time for the hydrolysis products 1 to 4 is 9, 17, 24 and 29.5 min respectively)

EXAMPLE 6

500 g of overfermented cocoa beans obtained from various genotypes of *Theobroma cacao* are treated enzymati-

cally in a manner identical to that described in Example 5. The pH of the inactivated mixture is then adjusted to 5–6, 0.3% glucose and 0.6% fructose are added, the mixture is dried by evaporation of water under vacuum during gentle heating (60° C.) until the moisture content is less than 5%, it is roasted in an oven at 130° C. for 15 min, and the flavor given off by the roasted mixture is analysed by the sensory test described above. The results show that the nibs from overfermented beans, treated according to the invention and roasted, have an intense flavor characteristic of a cocoa flavor derived from well fermented and roasted beans.

EXAMPLE 7

Several nibs are prepared from cocoa beans fermented traditionally for 1 day, 140 mg of each nib are mixed with 100 μl of an aqueous solution of Maxinvert L10000 invertase (Gist Brocades) comprising various activity units, the mixtures are incubated for 30 min or 120 min, the reaction is stopped by heating at 95° C. for 1 min, and the glucose content of each mixture is determined by means of the method described above. The results presented in FIG. 1 show that 1 unit/ml of invertase is sufficient to hydrolyse more than 80% of the sucrose to glucose and fructose.

EXAMPLE 8

A liquor from underfermented Sanchez cocoa beans (175 g) is incubated for 2 h at 50° C. in 350 ml of water whose pH is adjusted to pH 4.5 with a solution of acetic acid (activation of the endoproteases), then the pH is adjusted to 7 with a solution of potassium carbonate and the mixture is incubated for 15 min at 50° C. with the Maxinvert L10000 invertase (20 units/g) and carboxypeptidase A (0.06 units/ml), or the mixture is incubated for 15 min at 50° C. with 20 units/g of Maxinvert L10000 invertase and 1% Corolase PP protease (Roehm, DE) or for 60 min at 50° C. with 20 units/g of Maxinvert L10000 invertase and 1% Promod 192P protease (Biocatalyst, UK) or 1% Promod 279P protease (Biocatalyst). The reaction is stopped by heating the mixture at 95° C. for 5 min. The degree of hydrolysis of the proteins is finally analysed by determining the hydrolysis product content of the liquor (methods above).

After the reaction, the pH of the mixture is adjusted to 5.2, the mixture is dried, it is roasted and it is subjected to the sensory analysis described above.

The results presented in Table 5 below show that flavor precursors are formed by using the protease and invertase preparations.

TABLE 5

Enzymes	Amino acids (μmol/g dry weight) Total	Hydrophobic	% hydrophobic amino acid (Phe, Leu, Ala)	Hydrolysis products (area: arbitrary unit) Peak 1	Peak 2	Peak 3	Glucose formed (mg/g)
No treatment	36.6	10.6	29.0	412	651	377	0.0
Promod 192P	49.8	15.4	30.9	607	1012	494	5.2
Promod 279P	53.4	16.3	30.5	575	958	470	5.6
Corolase PP	44.3	15.6	35.2	1053	1423	1088	1.7

TABLE 5-continued

Enzymes	Amino acids (μmol/g dry weight) Total	Hydrophobic	% hydrophobic amino acid (Phe, Leu, Ala)	Hydrolysis products (area: arbitrary unit) Peak 1	Peak 2	Peak 3	Glucose formed (mg/g)
Carboxypeptidase	37.6	12.9	34.3	759	1194	646	2.3

(The retention time for the hydrolysis product 1 to 3 is 9, 17 and 24 min respectively)

EXAMPLE 9

Results similar to those obtained in Example 8 are obtained if, under the same conditions, insufficiently fermented Indonesian Sulawesi cocoa beans are treated with a protease and if the invertase is replaced by an addition of 0.6% fructose and 0.3% of glucose during the enzymatic treatment.

EXAMPLE 10

In a manner similar to Example 8, a liquor from underfermented Sanchez cocoa beans is incubated with 20 units/g of invertase and with various concentrations of the Promod 192P protease while allowing the endoprotease and the Promod 192 protease to act at the same time or consecutively at pH 4.5. The reaction is stopped by heating the mixture at 95° C., for 5 min (except for test 5). The degree of hydrolysis of the proteins is analysed by determining the hydrolysis product content of the liquor (methods above). The pH of the mixture is adjusted to 5.2, the mixture is dried, it is roasted and it is subjected to the sensory analysis described above.

The reaction conditions are presented in Table 6 below. The results presented in Table 7 below show (1) that the enzyme concentration can be reduced, (2) that all the reactions can be performed in a single step, (3) that it is possible to avoid inactivating the mixture before drying, and (4) that the water content can be reduced during the incubation.

TABLE 6

Tests	Enzyme Promod 192P	Endoprotease pH 4.5	Promod 192P pH 4.5	Invertase pH 4.5	Cocoa Liquor (g)	Added water (ml)	Heating before drying	Final pH
1	Control: no treatment							
2	1.0%	2 h	1 h	20 U/g	175	350	yes	5.2
3	1.0%	3 h, at the same time		20 U/g	175	350	yes	5.2
4	0.2%	3 h, at the same time		20 U/g	175	350	yes	5.2
5	1.0%	2 h	1 h	20 U/g	175	350	no	5.2
6	1.0%	2 h	1 h	20 U/g	175	175	yes	5.2

TABLE 7

Tests	Amino acids (μmol/g dry) Total	Hydrophobic	% hydrophobic amino acid (Phe, Leu, Ala)	Hydrolysis products (area: arbitrary unit) Peak 1	Peak 2	Peak 3	Glucose formed (mg/g)
1	36.0	10.6	28.9	412	651	377	0.0
2	60.9	18.5	30.4	736	1277	560	4.6
3	69.3	20.7	29.8	1025	1692	751	4.3
4	46.2	14.0	30.4	547	942	427	5.0
5	104.6	31.6	30.2	1322	2241	1167	5.4
6	65.3	20.6	31.5	798	1444	606	3.8

(The retention time for the hydrolysis products 1 to 3 is 9, 17 at 24 min respectively)

After the reaction, the pH of the mixtures is adjusted to 5.2, they are dried, they are roasted and they are subjected to the sensory analysis described above. The results show that the bad flavors specific to insufficiently fermented cocoa beans have disappeared. Furthermore, the cocoa flavor developed in the treated mixtures is similar to that desired. In particular, the samples from test 5 (reduced water content) are particularly preferred.

We claim:

1. Process for overcoming variability in the flavor precursor composition of mixtures of fermented cocoa beans, which comprises:

preparing a nib or a liquor from a mixture of (1) cocoa beans of different origins; or (2) cocoa beans subjected to different stages of fermentation of 1 to 15 days;

mixing the nib or liquor with at least one technical protease in an aqueous medium at a pH of 3–8;

incubating the protease-containing mixture for a time and at a temperature sufficient to hydrolyse the proteins and the peptides present therein; and

roasting the incubated mixture to obtain a composition having a flavor characteristic of well-fermented and roasted cocoa beans.

2. The process according to claim 1, wherein the incubation step is carried out for a time and at a temperature sufficient to obtain at least 10 μmol of hydrophobic amino acids per gram of dry matter and at least 1.4 times more hydrolysis products, compared with those initially present in the cocoa beans.

3. The process according to claim 1, wherein the aqueous medium has a pH of 4–8, and the incubating step is carried out at 10°–60° C. for 5 minutes to 20 hours.

4. The process according to claim 1, wherein the mixture of beans includes beans from more than one genotype of cocoa trees.

5. The process according to claim 1, wherein the mixture of the nib or liquor with at least one technical protease comprises 10–80% by weight of the cocoa bean nib or liquor and 1–100 units of technical protease per gram of the mixture.

6. The process according to claim 1, which further comprises adding at least one technical enzyme chosen from the group consisting of invertases, glycosidases, cellulases, pectinases and oxydases to the mixture of the nib or liquor with at least one technical protease prior to the incubating step.

7. The process according to claim 1, which further comprises adding at least 0.1% by weight of a reducing sugar to the nib or liquor prior to roasting.

8. The process of claim 1, which further comprises drying the incubated mixture prior to roasting.

9. A process for overcoming variability in the flavor precursor composition of mixtures of fermented cocoa beans, which comprises:

preparing a nib or a liquor from a mixture of (1) cocoa beans of different origins; or (2) cocoa beans subjected to different stages of fermentation of 1 to 15 days;

mixing the nib or liquor with an aqueous medium at a pH of 3–6;

incubating the aqueous mixture at a temperature of 40°–60° C. for a time of 10 minutes to 20 hours;

adjusting the pH of the incubated mixture to 4–8;

adding at least one technical protease to the incubated mixture;

incubating the protease containing mixture for a time and at a temperature sufficient to hydrolyse the proteins and the peptides present therein; and

roasting the incubated protease containing mixture to obtain a composition having a flavor characteristic of well-fermented and roasted cocoa beans.

10. The process of claim 9, wherein the mixture of beans includes beans from more than one genotype of cocoa trees.

11. The process of claim 9, wherein the second incubation step is carried out for a time of 5 minutes to 20 hours and at a temperature of 10°–60° C.

12. The process of claim 9, wherein the mixture containing at least one technical protease comprises 10–80% by weight of the cocoa bean nib or liquor and 1–100 units of technical protease per gram of the mixture.

13. The process of claim 9, which further comprises adding at least one technical enzyme selected from the group consisting of invertases, glycosidases, cellulases, pectinases and oxydases to the mixture so that the technical enzyme is present in the mixture during at least one of the two incubating steps.

14. The process of claim 9, which further comprises adding at least 0.1% by weight of a reducing sugar to the nib or liquor prior to roasting.

15. The process of claim 9, which further comprises drying the incubated protease containing mixture prior to roasting.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 5,888,562

DATED : March 30, 1999

INVENTORS : Carl Erik Hansen et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the title page: Item [22]: change the filing date from "Jun. 10, 1996" to --Jun. 7, 1996--.

Signed and Sealed this

Fourteenth Day of September, 1999

Attest:

Q. TODD DICKINSON

Attesting Officer

Acting Commissioner of Patents and Trademarks

RELATED PROCEEDINGS APPENDIX

None.